

ALGEBRA
II

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Tuesday, August 16, 2022 — 12:30 to 3:30 p.m., only

Student Name _____

School Name _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III, and IV** directly in this booklet. All work should be written in pen, except graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will not be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice ...

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for
computations.

1 The Hot and Tasty Coffee chain conducts a survey of its customers at its location at the Staten Island ferry terminal. After the survey is completed, the statistical consultant states that 70% of customers who took the survey said the most important factor in choosing where to get their coffee is how fast they are served. Based on this result, Hot and Tasty Coffee can infer that

- (1) most of its customers in New York State care most about being served quickly
- (2) coffee drinkers care less about taste and more about being served quickly
- (3) most of its customers at the Staten Island ferry terminal care most about being served quickly
- (4) most of its customers at transportation terminals and stations care most about being served quickly

2 Given that i is the imaginary unit, the expression $(x - 2i)^2$ is equivalent to

- | | |
|---------------|---------------------|
| (1) $x^2 + 4$ | (3) $x^2 - 2xi - 4$ |
| (2) $x^2 - 4$ | (4) $x^2 - 4xi - 4$ |

3 The equation below can be used to model the height of a tide in feet, $H(t)$, on a beach at t hours.

$$H(t) = 4.8\sin\left(\frac{\pi}{6}(t + 3)\right) + 5.1$$

Using this function, the amplitude of the tide is

- | | |
|---------------------|---------|
| (1) $\frac{\pi}{6}$ | (3) 3 |
| (2) 4.8 | (4) 5.1 |

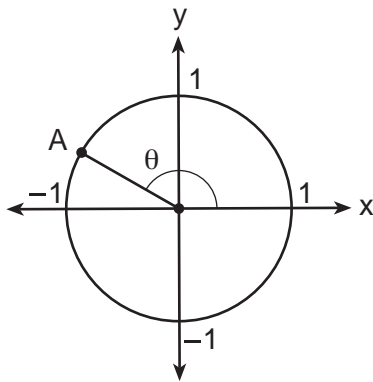
**Use this space for
computations.**

- 4 In watching auditions for lead singer in a band, Liem became curious as to whether there is an association between how animated the lead singer is and the amount of applause from the audience. He decided to watch each singer and rate the singer on a scale of 1 to 5, where 1 is the least animated and 5 is the most animated. He did this for all 5 nights of auditions and found that the more animated singers did receive louder applause.

The study Liem conducted would be best described as

- (1) experimental (3) a sample survey
(2) observational (4) a random assignment

- 5 In the diagram of a unit circle below, point A, $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$, represents the point where the terminal side of θ intersects the unit circle.

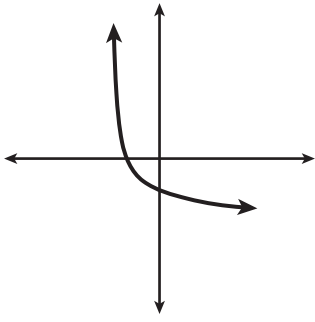


What is $m\angle\theta$?

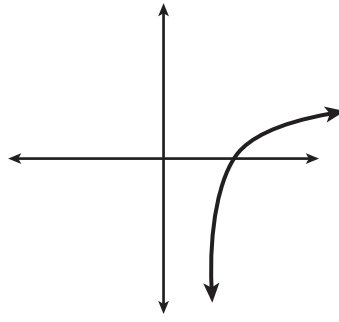
- (1) 30° (3) 135°
(2) 120° (4) 150°
- 6 Consider the function $f(x) = 2x^3 + x^2 - 18x - 9$. Which statement is true?
- (1) $2x - 1$ is a factor of $f(x)$. (3) $f(3) \neq f\left(-\frac{1}{2}\right)$
(2) $x - 3$ is a factor of $f(x)$. (4) $f\left(\frac{1}{2}\right) = 0$

Use this space for
computations.

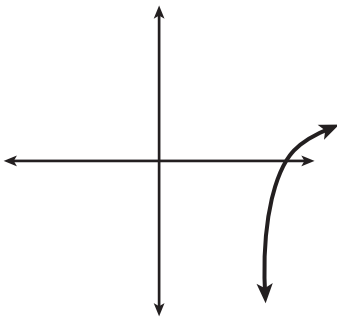
7 Which sketch could represent the function $m(x) = -\log_{100}(x - 2)$?



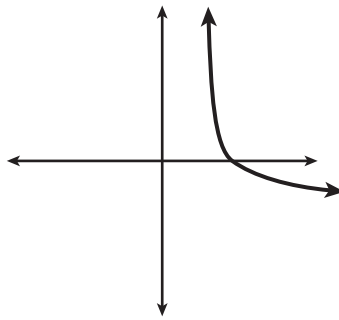
(1)



(3)



(2)



(4)

8 Which equation has roots of $3 + i$ and $3 - i$?

(1) $x^2 - 6x + 10 = 0$

(3) $x^2 - 10x + 6 = 0$

(2) $x^2 + 6x - 10 = 0$

(4) $x^2 + 10x - 6 = 0$

9 A local university has a current enrollment of 12,000 students. The enrollment is increasing continuously at a rate of 2.5% each year. Which logarithm is equal to the number of years it will take for the population to increase to 15,000 students?

(1) $\frac{\ln 1.25}{0.25}$

(3) $\frac{\ln 1.25}{2.5}$

(2) $\frac{\ln 3000}{0.025}$

(4) $\frac{\ln 1.25}{0.025}$

Use this space for
computations.

10 What is the total number of points of intersection of the graphs of the equations $y = e^x$ and $xy = 20$?

- (1) 1 (3) 3
(2) 2 (4) 0

11 The amount of a substance, $A(t)$, in grams, remaining after t days is modeled by $A(t) = 50(0.5)^{\frac{t}{3}}$. Which statement is false?

- (1) In 20 days, there is no substance remaining.
(2) After two half-lives, there is 25% of the substance remaining.
(3) The amount of the substance remaining can also be modeled by $A(t) = 50(2)^{\frac{-t}{3}}$.
(4) After one week, there is less than 10g of the substance remaining.

12 A parabola that has a vertex at (2,1) and a focus of (2,-3) has an equation of

- (1) $y = \frac{1}{16}(x - 2)^2 + 1$ (3) $y = -\frac{1}{16}(x - 2)^2 + 1$
(2) $y = -\frac{1}{16}(x + 2)^2 - 1$ (4) $y = -\frac{1}{16}(x - 2)^2 - 3$

Use this space for
computations.

13 The expression $(a\sqrt[3]{2b^2})(\sqrt[3]{4a^2b})$ is equivalent to

- (1) $2ab\sqrt[3]{a^2}$ (3) $2ab\sqrt[3]{2a^2}$
(2) $2ab$ (4) $2a^2b\sqrt[3]{2b}$

14 Given $f(x) = 3^{x-1} + 2$, as $x \rightarrow -\infty$

- (1) $f(x) \rightarrow -1$ (3) $f(x) \rightarrow 2$
(2) $f(x) \rightarrow 0$ (4) $f(x) \rightarrow -\infty$

15 For all values of x for which the expression is defined, $\frac{x^2 + 3x}{x^2 + 5x + 6}$ is equivalent to

- (1) $1 - \frac{x}{x+2}$ (3) $\frac{3x}{5x+6}$
(2) $\frac{x}{x+2}$ (4) $1 + \frac{1}{2x+6}$

16 A recursive formula for the sequence 64, 48, 36, ... is

- (1) $a_n = 64(0.75)^{n-1}$ (3) $a_n = 64 + (n-1)(-16)$
(2) $a_1 = 64$ (4) $a_1 = 64$
 $a_n = a_{n-1} - 16$ $a_n = 0.75a_{n-1}$

Use this space for
computations.

17 Which expression is equivalent to $\frac{x^3 - 2}{x - 2}$?

(1) x^2

(3) $x^2 - 2$

(2) $x^2 + 2x + 4 + \frac{6}{x - 2}$

(4) $x^2 - 2x + 4 - \frac{10}{x - 2}$

18 What is the solution set of the equation $\frac{4}{k^2 - 8k + 12} = \frac{k}{k - 2} + \frac{1}{k - 6}$?

(1) $\{-1, 6\}$

(3) $\{-1\}$

(2) $\{1, -6\}$

(4) $\{1\}$

19 Given the polynomial identity $x^6 + y^6 = (x^2 + y^2)(x^4 - x^2y^2 + y^4)$, which equation must also be true for all values of x and y ?

(1) $x^6 + y^6 = x^2(x^4 - x^2y^2 + y^4) + y^2(x^4 - x^2y^2 + y^4)$

(2) $x^6 + y^6 = (x^2 + y^2)(x^2 - y^2)(x^2 - y^2)$

(3) $(x^3 + y^3)^2 = (x^2 + y^2)(x^4 - x^2y^2 + y^4)$

(4) $(x^6 + y^6) - (x^2 + y^2) = x^4 - x^2y^2 + y^4$

20 Given $p(\theta) = 3\sin\left(\frac{1}{2}\theta\right)$ on the interval $-\pi < \theta < \pi$, the function p

(1) decreases, then increases (3) decreases throughout the interval

(2) increases, then decreases (4) increases throughout the interval

Use this space for
computations.

- 21 A company fired several employees in order to save money. The amount of money the company saved per year over five years following the loss of employees is shown in the table below.

Year	Amount Saved (in dollars)
1	59,000
2	64,900
3	71,390
4	78,529
5	86,381.9

Which expression determines the total amount of money saved by the company over 5 years?

- (1) $\frac{59,000 - 59,000(1.1)^5}{1 - 1.1}$ (3) $\sum_{n=1}^5 59,000(1.1)^n$
- (2) $\frac{59,000 - 59,000(0.1)^5}{1 - 0.1}$ (4) $\sum_{n=1}^5 59,000(0.1)^{n-1}$

- 22 A rush-hour commuter train has arrived on time 64 of its first 80 days. As arrivals continue, which equation can be used to find x , the number of consecutive days that the train must arrive on schedule to raise its on-time performance rate to 90%?

- (1) $\frac{64}{80 + x} = \frac{90}{100}$ (3) $\frac{64 + x}{80} = \frac{90}{100}$
- (2) $\frac{64 + x}{80 + x} = \frac{90}{100}$ (4) $\frac{x}{80 + x} = \frac{90}{100}$

**Use this space for
computations.**

23 Given $f(x) = -\frac{2}{5}x + 4$, which statement is true of the inverse function $f^{-1}(x)$?

- (1) $f^{-1}(x)$ is a line with slope $\frac{5}{2}$.
- (2) $f^{-1}(x)$ is a line with slope $\frac{2}{5}$.
- (3) $f^{-1}(x)$ passes through the point $(6, -5)$.
- (4) $f^{-1}(x)$ has a y -intercept at $(0, -4)$.

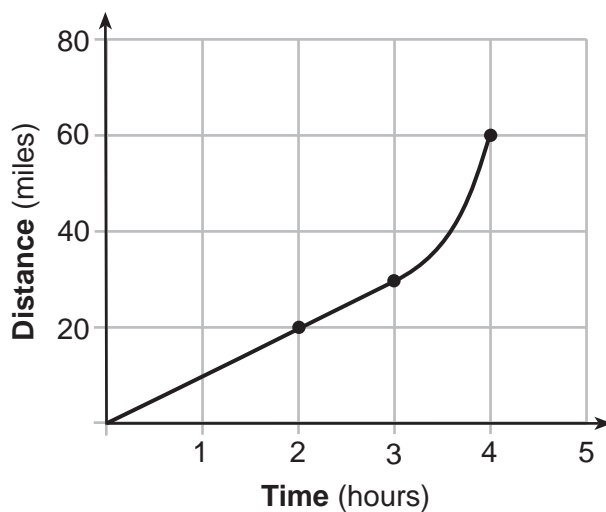
24 The amount of a substance, $A(t)$, that remains after t days can be given by the equation $A(t) = A_0(0.5)^{\frac{t}{0.0803}}$, where A_0 represents the initial amount of the substance. An equivalent form of this equation is

- (1) $A(t) = A_0(0.000178)^t$
 - (2) $A(t) = A_0(0.945861)^t$
 - (3) $A(t) = A_0(0.04015)^t$
 - (4) $A(t) = A_0(1.08361)^t$
-

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

27 Solve algebraically for all values of x :

$$\sqrt{4x + 1} = 11 - x$$

28 Given that $\left(\frac{\frac{17}{8}}{\frac{y}{5}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n .

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical
Male	39	17	42	12
Female	17	37	36	15

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x$$

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

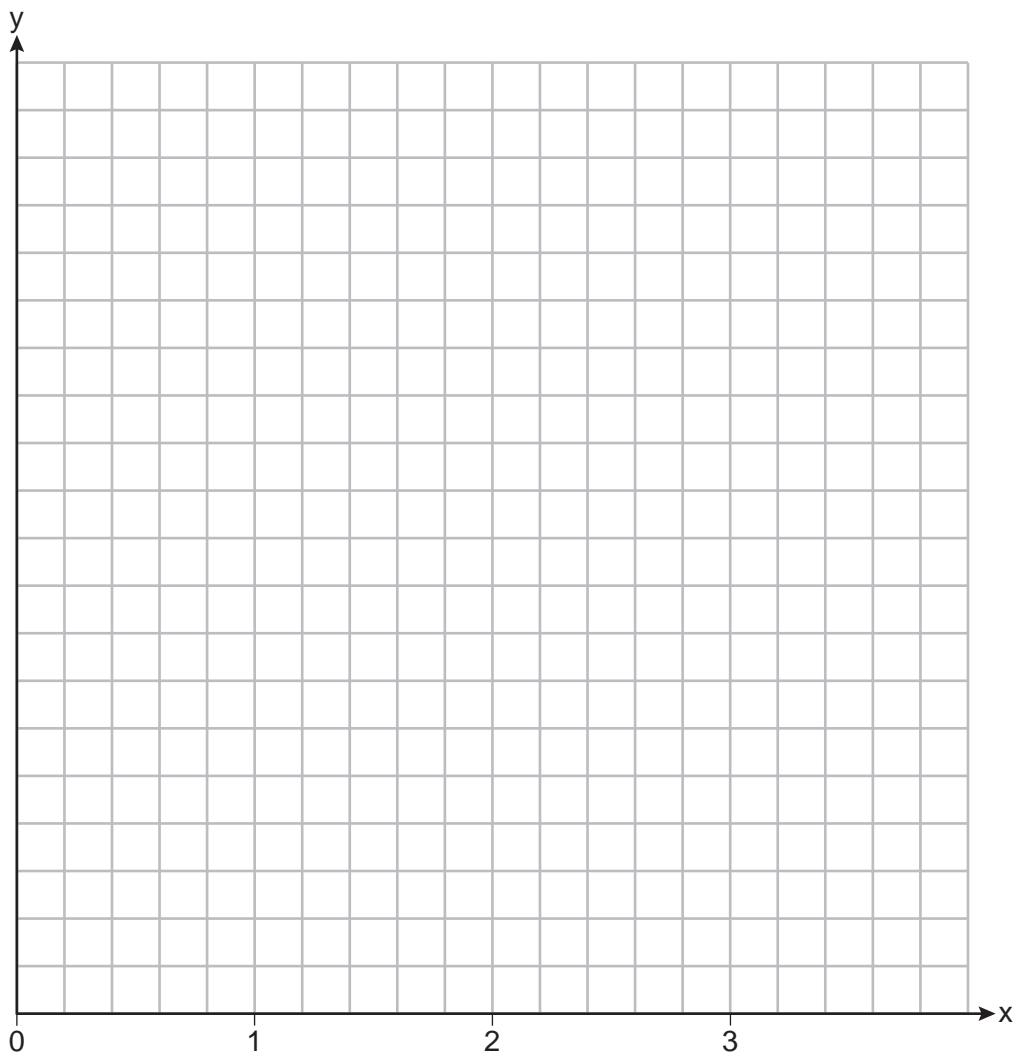
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.

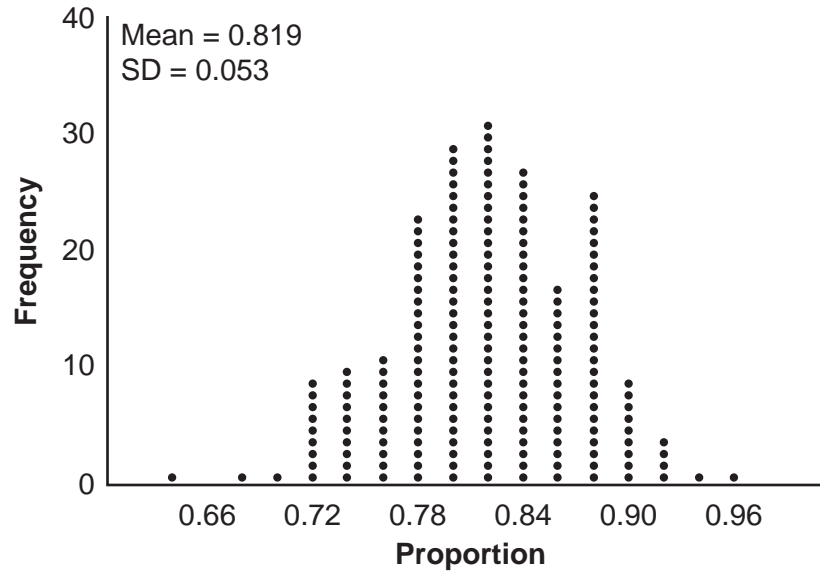


To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

Is $x = 4$ a root of $f(x)$? Explain your answer.

- 36** State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

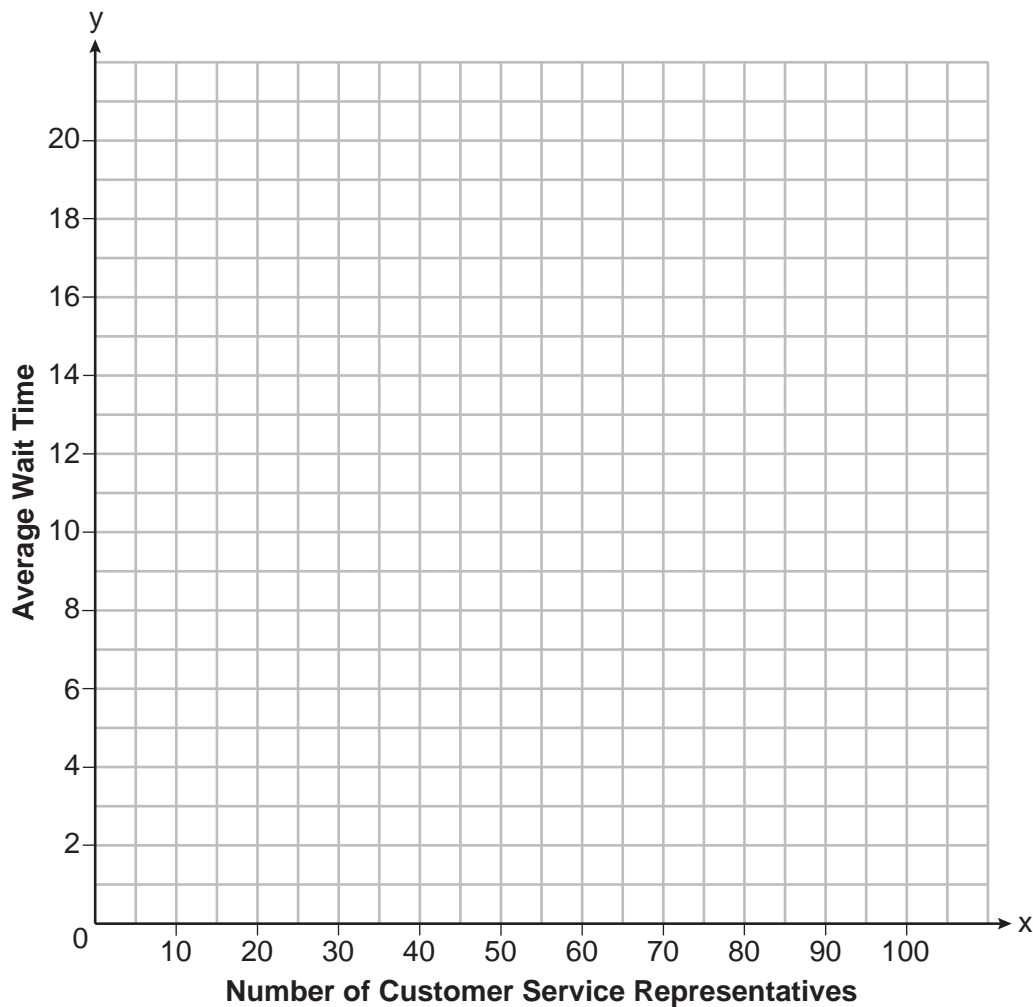
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

- 37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Question 37 continued

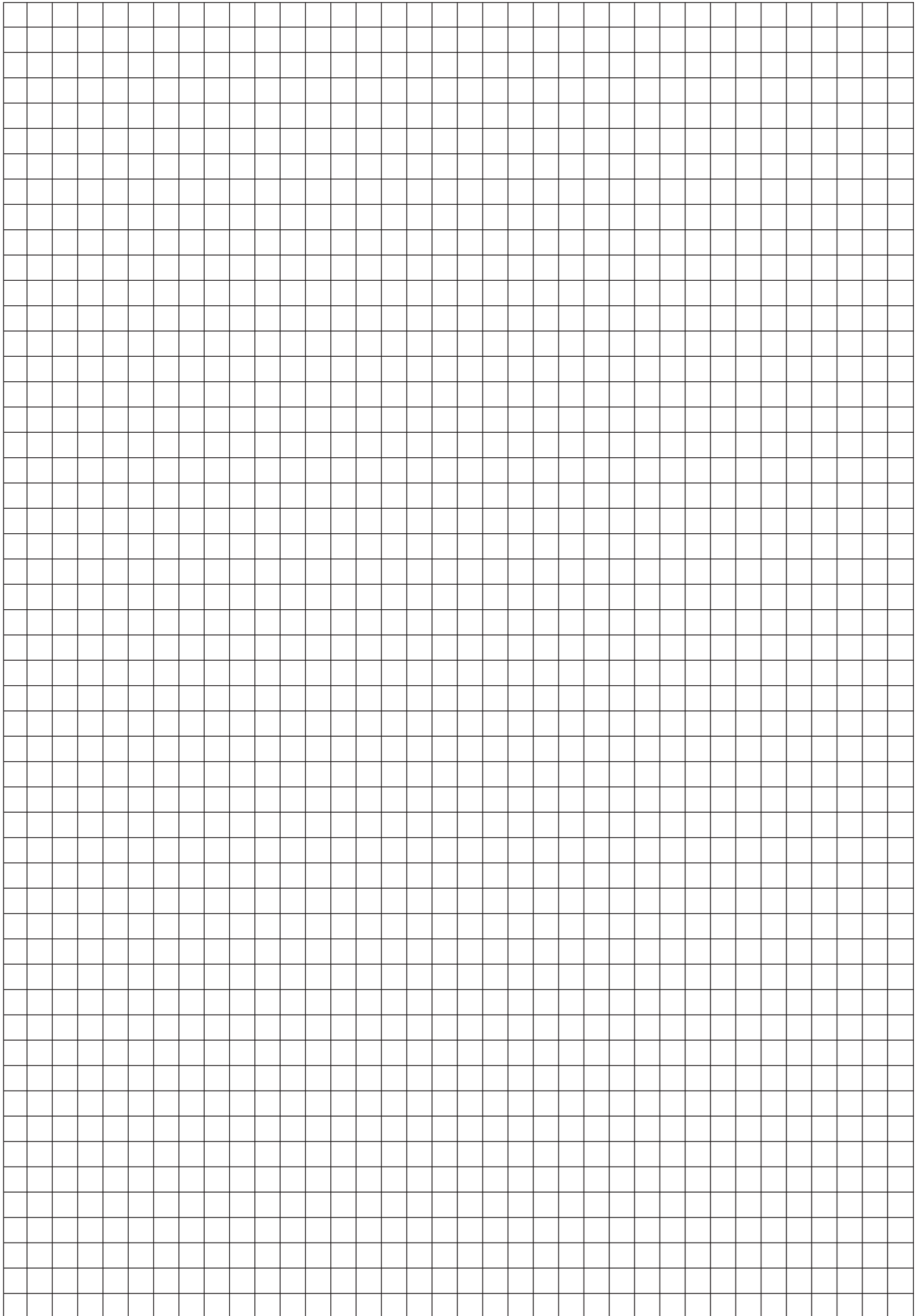
To the *nearest integer*, solve the equation $A(x) = B(x)$.

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

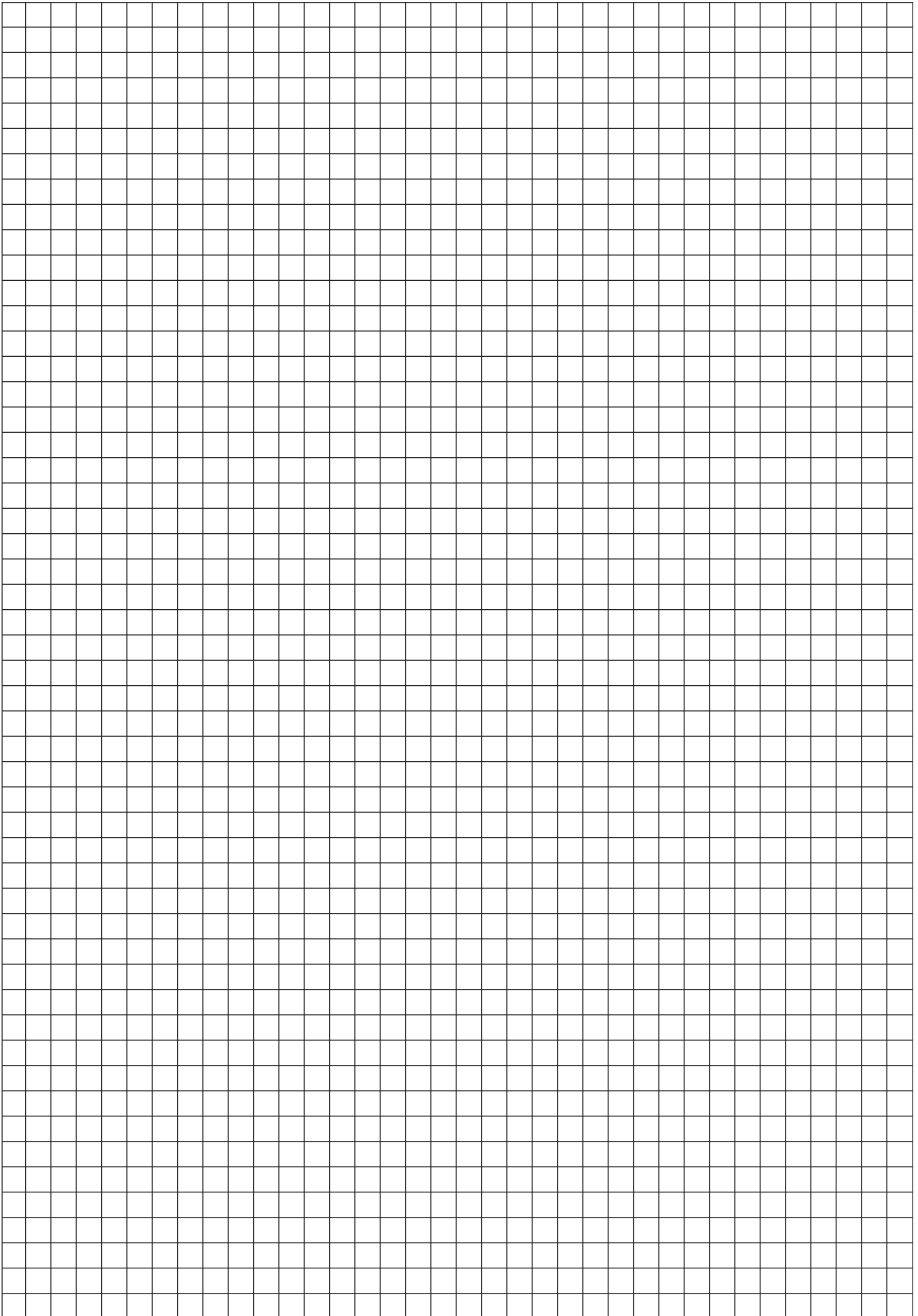
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Scrap Graph Paper — this sheet will *not* be scored.



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High School Math Reference Sheet

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilogram	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n - 1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian = $\frac{180}{\pi}$ degrees
Degrees	1 degree = $\frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

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Regents Examination in Algebra II – August 2022**Scoring Key: Part I (Multiple-Choice Questions)**

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Algebra II	August '22	1	3	MC	2	1
Algebra II	August '22	2	4	MC	2	1
Algebra II	August '22	3	2	MC	2	1
Algebra II	August '22	4	2	MC	2	1
Algebra II	August '22	5	4	MC	2	1
Algebra II	August '22	6	2	MC	2	1
Algebra II	August '22	7	4	MC	2	1
Algebra II	August '22	8	1	MC	2	1
Algebra II	August '22	9	4	MC	2	1
Algebra II	August '22	10	1	MC	2	1
Algebra II	August '22	11	1	MC	2	1
Algebra II	August '22	12	3	MC	2	1
Algebra II	August '22	13	1	MC	2	1
Algebra II	August '22	14	3	MC	2	1
Algebra II	August '22	15	2	MC	2	1
Algebra II	August '22	16	4	MC	2	1
Algebra II	August '22	17	2	MC	2	1
Algebra II	August '22	18	3	MC	2	1
Algebra II	August '22	19	1	MC	2	1
Algebra II	August '22	20	4	MC	2	1
Algebra II	August '22	21	1	MC	2	1
Algebra II	August '22	22	2	MC	2	1
Algebra II	August '22	23	3	MC	2	1
Algebra II	August '22	24	1	MC	2	1

Regents Examination in Algebra II – August 2022**Scoring Key: Parts II, III, and IV (Constructed-Response Questions)**

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Algebra II	August '22	25	-	CR	2	1
Algebra II	August '22	26	-	CR	2	1
Algebra II	August '22	27	-	CR	2	1
Algebra II	August '22	28	-	CR	2	1
Algebra II	August '22	29	-	CR	2	1
Algebra II	August '22	30	-	CR	2	1
Algebra II	August '22	31	-	CR	2	1
Algebra II	August '22	32	-	CR	2	1
Algebra II	August '22	33	-	CR	4	1
Algebra II	August '22	34	-	CR	4	1
Algebra II	August '22	35	-	CR	4	1
Algebra II	August '22	36	-	CR	4	1
Algebra II	August '22	37	-	CR	6	1

Key

MC = Multiple-choice question

CR = Constructed-response question

The chart for determining students' final examination scores for the **August 2022 Regents Examination in Algebra II** will be posted on the Department's web site at: <https://www.nysedregents.org/algebratwo/> on the day of the examination. Conversion charts provided for the previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Tuesday, August 16, 2022 — 12:30 to 3:30 p.m., only

RATING GUIDE

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: <http://www.nysed.gov/state-assessment/high-school-regents-examinations> and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Algebra II. This guidance is intended to be part of the scorer training. Schools are encouraged to incorporate the Model Response Sets into the scorer training or to use them as additional information during scoring. While not reflective of all scenarios, the model responses selected for the Model Response Set illustrate how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department's web site at <https://www.nysedregents.org/algebratwo/>.

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra II. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the constructed-response questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Schools are not permitted to rescore any of the constructed-response questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <http://www.nysed.gov/state-assessment/> by Tuesday, August 16, 2022. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra II are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase “such as”), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

III. Appropriate Work

Full-Credit Responses: The directions in the examination booklet for all the constructed-response questions state: “Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.” The student has the responsibility of providing the correct answer **and** showing how that answer was obtained. The student must “construct” the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

Responses With Errors: Rubrics that state “Appropriate work is shown, but...” are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has **not** been shown. Other rubrics address incomplete responses.

IV. Multiple Errors

Computational Errors, Graphing Errors, and Rounding Errors: Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

Conceptual Errors: A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents. If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

For 4- and 6-credit questions, if a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors. Refer to the rubric for specific scoring guidelines.

Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(25) [2] 20, and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] 20, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(26) [2] $(x - 2)(x + 3)(x - 3)$, and correct work is shown.

[1] Appropriate work is shown, but one computational or factoring error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] Appropriate work is shown to find $(x - 2)(x^2 - 9)$, but no further correct work is shown.

or

[1] $(x - 2)(x + 3)(x - 3)$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (27) [2] 6 and correct algebraic work is shown.
- [1] Appropriate work is shown, but one computational, factoring, or simplification error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] Appropriate work is shown, but 20 is not rejected.
- or*
- [1] 6, but a method other than algebraic is used.
- or*
- [1] 6, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (28) [2] $-\frac{7}{2}$ or equivalent, and correct work is shown.
- [1] Appropriate work is shown, but one computational error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] $-\frac{7}{2}$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (29) [2] $-\frac{1}{\sqrt{10}}$ or equivalent, and correct work is shown.
- [1] Appropriate work is shown, but one computational error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] Appropriate work is shown, but the answer is stated as a decimal.
- or*
- [1] $-\frac{1}{\sqrt{10}}$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (30) [2] 1237, and correct work is shown.
- [1] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] 1237, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (31) [2] A negative response is indicated and a correct justification is given.
- [1] Appropriate work is shown, but one computational error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] No, but an incomplete justification is given.
- [0] No, but no justification is given.
- or*
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(32) [2] (3.5,4), (-1,13), and correct algebraic work is shown.

[1] Appropriate work is shown, but one computational or factoring error is made.

or

[1] Appropriate work is shown, but one conceptual error is made.

or

[1] Appropriate work is shown to find $x = 3.5$ and $x = -1$, but no further correct work is shown.

or

[1] (3.5,4), (-1,13), but a method other than algebraic is used.

or

[1] (3.5,4), (-1,13), but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33) [4] $p(t) = 11,000(2)^{\frac{t}{20}}$ or an equivalent function is written, 130.13, and correct algebraic work is shown.

[3] Appropriate work is shown, but one computational, notation, or rounding error is made.

[2] Appropriate work is shown, but two or more computational, notation, or rounding errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] $p(t) = 11,000(2)^{\frac{t}{20}}$, but no further correct work is shown.

or

[2] Appropriate work is shown to find 130.13, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual and one computational, notation, or rounding error are made.

or

[1] 130.13, but a method other than algebraic is used.

or

[1] 130.13, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (34) [4] A correct graph is drawn and 12.6 is stated.
- [3] Appropriate work is shown, but one graphing or rounding error is made.
- [2] A correct graph is drawn, but no further correct work is shown.
- or*
- [2] Appropriate work is shown, but two or more graphing errors are made.
- or*
- [2] Appropriate work is shown, but one conceptual error is made.
- or*
- [2] 12.6, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one graphing error are made.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(35) [4] $3x^2 + 8x + 34 + \frac{135}{x-4}$ and correct work is shown, a negative response is indicated, and a correct explanation is written.

[3] Appropriate work is shown, but one computational or notation error is made.

[2] Appropriate work is shown, but two computational or notation errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find $3x^2 + 8x + 34 + \frac{135}{x-4}$, but no further correct work is shown.

or

[2] No, and a correct explanation is written, but no further correct work is shown.

[1] $3x^2 + 8x + 34 + \frac{135}{x-4}$, but no work is shown.

or

[1] Appropriate work is shown, but one conceptual error and one computational or notation error are made.

or

[1] No, but an incomplete explanation is written.

[0] No, but the explanation is incorrect or missing.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (36) [4] A correct interval is determined, such as $(0.713, 0.925)$, and a correct explanation is written.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- [2] Appropriate work is shown, but two or more computational errors are made.
- or*
- [2] Appropriate work is shown, but one conceptual or rounding error is made.
- or*
- [2] Appropriate work is shown to determine $(0.713, 0.925)$, but no further correct work is shown.
- or*
- [2] A correct explanation is written, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- or*
- [1] $(0.713, 0.925)$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

Part IV

For each question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(37) [6] Correct graphs are drawn with at least one labeled, 35, 2, and a correct explanation is written.

[5] Appropriate work is shown, but one computational, graphing, labeling, or rounding error is made.

[4] Appropriate work is shown, but two computational, graphing, labeling, or rounding errors are made.

or

[4] Appropriate work is shown, but one conceptual error is made.

[3] Appropriate work is shown, but three computational, graphing, labeling, or rounding errors are made.

[2] Appropriate work is shown, but two conceptual errors are made.

or

[2] Correct graphs for $A(x)$ and $B(x)$ are drawn and at least one is labeled correctly, but no further correct work is shown.

or

[2] 35, but no further correct work is shown.

or

[2] 2, and a correct explanation in context is written, but no further correct work is shown.

[1] Appropriate work is shown, but two conceptual errors and one computational, graphing, labeling, or rounding error are made.

or

[1] 2, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

**Map to the Learning Standards
Algebra II
August 2022**

Question	Type	Credits	Cluster
1	Multiple Choice	2	S-IC.A
2	Multiple Choice	2	N-CN.A
3	Multiple Choice	2	N-Q.A
4	Multiple Choice	2	S-IC.B
5	Multiple Choice	2	F-TF.A
6	Multiple Choice	2	A-APR.B
7	Multiple Choice	2	F-IF.C
8	Multiple Choice	2	N-CN.C
9	Multiple Choice	2	F-LE.A
10	Multiple Choice	2	A-REI.D
11	Multiple Choice	2	F-LE.B
12	Multiple Choice	2	G-GPE.A
13	Multiple Choice	2	N-RN.A
14	Multiple Choice	2	F-IF.C
15	Multiple Choice	2	A-SSE.A
16	Multiple Choice	2	F-BF.A
17	Multiple Choice	2	A-APR.D
18	Multiple Choice	2	A-REI.A
19	Multiple Choice	2	A-APR.C
20	Multiple Choice	2	F-TF.B

21	Multiple Choice	2	A-SSE.B
22	Multiple Choice	2	A-CED.A
23	Multiple Choice	2	F-BF.B
24	Multiple Choice	2	A-SSE.B
25	Constructed Response	2	F-IF.B
26	Constructed Response	2	A-SSE.A
27	Constructed Response	2	A-REI.A
28	Constructed Response	2	N-RN.A
29	Constructed Response	2	F-TF.C
30	Constructed Response	2	S-ID.A
31	Constructed Response	2	S-CP.A
32	Constructed Response	2	A-REI.C
33	Constructed Response	4	F-LE.A
34	Constructed Response	4	F-IF.B
35	Constructed Response	4	A-APR.B
36	Constructed Response	4	S-IC.B
37	Constructed Response	6	A-REI.D

Regents Examination in Algebra II
August 2022
Chart for Converting Total Test Raw Scores to
Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the August 2022 Regents Examination in Algebra II* will be posted on the Department’s web site at: <http://www.nysed.gov/state-assessment/> by Tuesday, August 16, 2022. Conversion charts provided for previous administrations of the Regents Examination in Algebra II must NOT be used to determine students’ final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to <https://www.surveymonkey.com/r/8LNLLDW>.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II

Tuesday, August 16, 2022 — 12:30 to 3:30 p.m., only

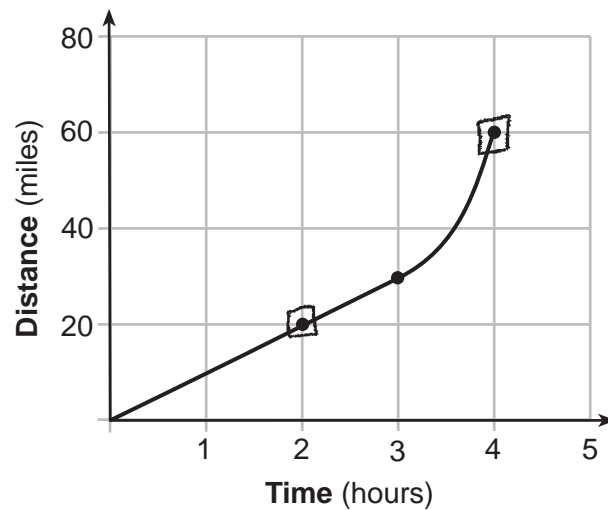
MODEL RESPONSE SET

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Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



Distance₁ = 20m
time = Hour 2

Distance

$$\begin{matrix} x_1 & y_1 \\ (2, & 20) \\ x_2 & y_2 \\ (4, & 60) \end{matrix}$$

$$\frac{\Delta Y}{\Delta X}$$

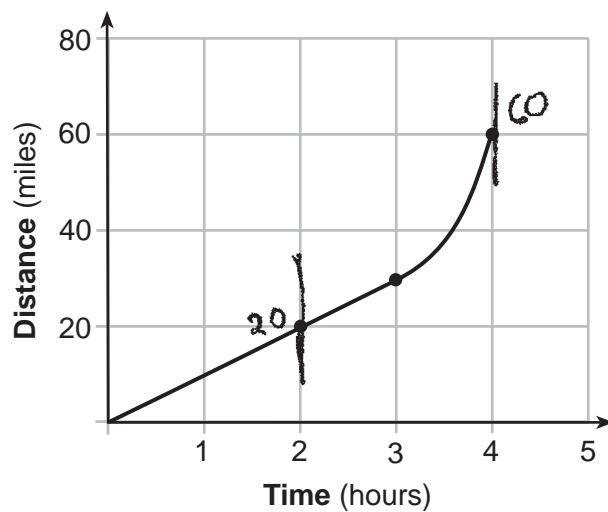
$$\frac{60-20}{4-2} = \frac{40}{2} = 20$$

20 mph = average rate of change

Score 2: The student gave a complete and correct response.

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

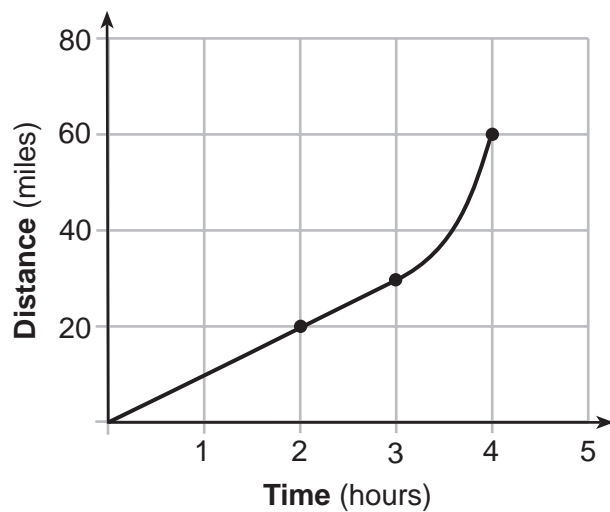


$$\frac{40 \text{ m}}{2 \text{ hr}} = 20 \text{ mph}$$

Score 2: The student gave a complete and correct response.

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

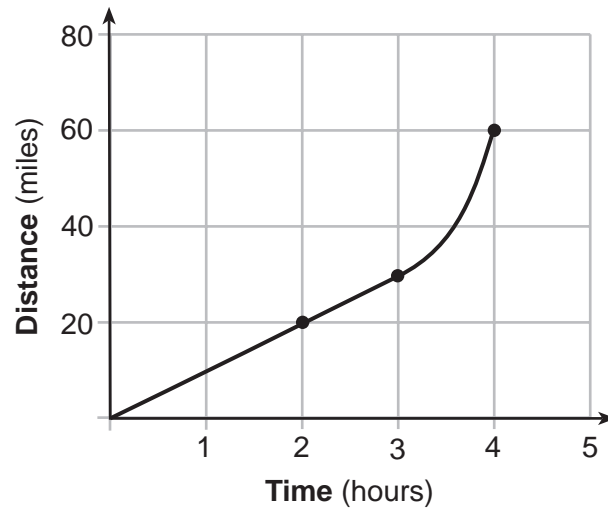


Average rate of change = 20 mph

Score 1: The student did not show any work.

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



$$\frac{20}{2} = 10 \text{ mph}$$

$$10 + 8.\bar{3} + 15 = \frac{33.\bar{3}}{3}$$

$$\frac{25}{3} = 8.\bar{3} \text{ mph}$$

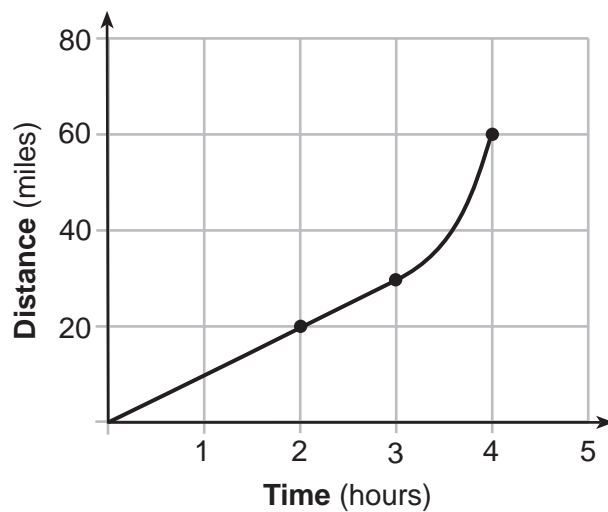
$$= 11.\bar{1} \text{ mph}$$

$$\frac{60}{4} = 15 \text{ mph}$$

Score 0: The student did not show enough correct work to receive any credit.

Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.



He increased by
40 miles

Score 0: The student did not show enough correct work to receive any credit.

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

$$x^2(x-2) \quad | \quad -9(x-2)$$



$$(x^2 - 9)(x - 2)$$

$$(x + 3)(x - 3)(x - 2)$$

Score 2: The student gave a complete and correct response.

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

$$(x^3 - 2x^2)(-9x + 18)$$

$$x^2(x-2) - 9(x-2)$$

$$(x^2 - 9)(x-2)$$

$$(x-3)(x+3)(x-2)$$

$$\begin{array}{l} x-3=0 \\ +3 \quad +3 \\ x=3 \end{array}$$

$$\begin{array}{l} x+3=0 \\ -3 \quad -3 \\ x=-3 \end{array}$$

$$\begin{array}{l} x-2=0 \\ +2 \quad +2 \\ x=2 \end{array}$$

$$X = \{-3, 2, 3\}$$

Score 1: The student found the roots after factoring completely.

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

$$\begin{array}{r|l} x^3 - 2x^2 & 9x + 18 \\ x(x-2) & -9(x-2) \\ \hline & (x-9)(x-2) \end{array}$$

Score 1: The student made a factoring error.

Question 26

26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

$$\begin{aligned} & x^3 - 2x^2 - 9x + 18 \\ & x(x^2 - 2x - 9 + 18) \\ & x(x^2 - 2x + 9) \\ & \boxed{x(x-3)(x+3)} \end{aligned}$$

Score 0: The student made multiple factoring errors.

Question 26

26 Factor the expression $(x^3 - 2x^2)(9x + 18)$ completely.

$$x^2(x-2) + 9(x-2)$$

$$(x^2 + 9)(x-2) = 0$$

$$\begin{array}{r} x^2 + 9 = 0 \\ -9 \quad -9 \\ \hline \sqrt{x^2} = \sqrt{-9} \\ \pm 3i \end{array}$$

$$x = 2$$

Score 0: The student made a factoring error and found the roots.

Question 27

27 Solve algebraically for all values of x :

$$\sqrt{4x+1} = 11-x$$

$$(\sqrt{4x+1})^2 = (11-x)^2$$

$$4x+1 = x^2 - 22x + 121$$

$$0 = x^2 - 26x + 120$$

$$(x-20)(x-6)$$

$$x = 20, 6$$

$$(11-x)(11-x)$$

$$121 - 11x - 11x + x^2$$

$$121 - 22x + x^2$$

$$\sqrt{4(20)+1} = 11-20$$

$$\sqrt{81} = -9$$

$$9 \neq -9$$

$$\sqrt{4(6)+1} = 11-6$$

$$\sqrt{25} = 5$$

$$5 = 5$$

$$\boxed{x = 6}$$

Score 2: The student gave a complete and correct response.

Question 27

27 Solve algebraically for all values of x :

$$(\sqrt{4x+1})^2 = (11-x)^2$$

$$4x+1 = (11-x)(11-x)$$

$$4x+1 = 121 - 11x - 11x + x^2$$

$$4x+1 = x^2 - 22x + 121$$

$$x^2 - 26x + 120 = 0$$

$$(x^2 - 6x)(-20x + 120) = 0$$

$$x(x-6) + 20(x-6) = 0$$

$$(x-6)(x-20) = 0$$

$$x = 6 \quad x = 20$$

$$\begin{array}{r} p: 120 \\ q: -26 \\ \hline -6 \cdot -20 \end{array}$$

Score 2: The student gave a complete and correct response.

Question 27

27 Solve algebraically for all values of x :

$$\begin{aligned} \sqrt{4x+1} &= (1-x)^2 \\ 4x+1 &= (1-x)^2 \quad (1-x)(1-x) \\ &= 1-1x-1x+x^2 \\ -4x-1 \quad -4x-1 \\ 0 &= x^2-2x+120 \\ 0 &= (x-20)(x-6) \\ x-20 &= 0 & x-6 &= 0 \\ +20 \quad +20 & & +6 \quad +6 & \\ \hline x &= 20 & x &= 6 \end{aligned}$$

CHECKS

$$\sqrt{4x+1} = 1-x$$

$$\sqrt{4(20)+1} = 1-(20)$$

$$\sqrt{80+1}$$

$$\pm \sqrt{81} = 1-20$$

$$\pm 9 = 1-20$$

$$-9 = -9$$

$$\sqrt{4x+1} = 1-x$$

$$\sqrt{4(6)+1} = 1-(6)$$

$$\sqrt{25} = 1-6$$

$$5 = 5$$

Score 1: The student made a computational error in the check for extraneous roots.

Question 27

27 Solve algebraically for all values of x:

$$\sqrt{4x+1} = 11-x$$

$$x=5$$

$$x=6?$$

$$\sqrt{4(6)+1} = 11-6$$

$$\sqrt{25} = 5$$

$$5 = 5 \checkmark$$

$$x=6$$

~~$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$~~

~~$$x = \frac{28 \pm \sqrt{784 - 4(1)(120)}}{2(1)}$$~~

~~$$x = \frac{-11 \pm \sqrt{121 - 4(1)(11)}}{2(1)}$$~~

~~$$x = 11 \pm \sqrt{11}$$~~

~~$$x = 11 \pm \sqrt{11}$$~~

No solution

~~$$\frac{11 \pm \sqrt{11}}{2}$$~~

~~$$\frac{28 \pm \sqrt{704}}{2}$$~~

~~$$\frac{2/8 \pm \sqrt{176}}{7}$$~~

~~$$28 \pm 8\sqrt{11}$$~~

~~$$11 \pm \sqrt{176}$$~~

~~$$11 \pm 4\sqrt{11}$$~~

Score 1: The student received credit for stating 6.

Question 27

27 Solve algebraically for all values of x :

$$\sqrt{4x+1} = 11-x$$

$$(\sqrt{4x+1})^2 = (11-x)^2 (11-x)$$

$$4x+1 = -x^2 - 11x - 11x + 121$$

$$4x+1 = -x^2 - 22x + 121$$

$$+x^2 + 22x - 121$$

$$x^2 + 26x - 120 = 0$$

~~$$(x+30)(x-4) = 0$$~~

$$(x+30)(x-4) = 0$$

~~$$x = -30, 4$$~~

No Solutions

check

$$\sqrt{4(-30)+1} = 11 - (-30)$$

~~$$\sqrt{-119} = 41$$~~

$$\sqrt{4(4)+1} = 11 - 4$$

~~$$\sqrt{17} = 7$$~~

Score 1: The student made one computational error.

Question 27

27 Solve algebraically for all values of x :

$$\sqrt{4x+1} = 11-x$$

$$4x+1 = -x^2+121$$

$$+x^2 \quad +x^2$$

$$x^2+4x+1 = 121$$

$$-121 \quad -121$$

$$x^2+4x-120=0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-4 \pm \sqrt{16 - 4(1)(-120)}}{2}$$

$$x = \frac{-2 \pm \sqrt{496}}{2}$$

$$x = -2 \pm 2\sqrt{31}$$

496
 \uparrow
 2 248
 \uparrow
 2 124
 \uparrow
 2 62
 \uparrow
 2 31

Score 0: The student made multiple errors.

Question 27

27 Solve algebraically for all values of x :

$$\sqrt{4x+1} = 11-x$$

$$4x+1 = (11-x)^2$$

$$4x+1 = 121 - 22x - x^2$$

$$26x = 120 - x^2$$

$$0 = -x^2 - 26x + 120$$

$$x^2 + 26x - 120$$

$$(x-4)(x+30)$$

$$x=4 \quad x=-30$$

$$(11-x)(11-x)$$

$$121 - 11x - 11x - x^2$$

$$121 - 22x - x^2$$

Score 0: The student made a computational error and did not check for extraneous roots.

Question 28

28 Given that $\left(\frac{y^{\frac{17}{8}}}{y^{\frac{5}{4}}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n .

$$\left(\frac{y^{17/8}}{y^{10/8}}\right)^{-4}$$

$$\left(y^{7/8}\right)^{-4}$$

$$y^{-7/2}$$

$$n = -7/2$$

Score 2: The student gave a complete and correct response.

Question 28

28 Given that $\left(\frac{\frac{17}{8}}{\frac{y}{5}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n .

$$\left(\frac{y^{\frac{10}{8}}}{y^{\frac{17}{8}}}\right)^4$$

$$\left(y^{-\frac{7}{8}}\right)^4$$

$$y^{-\frac{7}{2}}$$

$$\text{so } n = -\frac{7}{2}$$

Score 2: The student gave a complete and correct response.

Question 28

28 Given that $\left(\frac{\frac{17}{8}}{\frac{y}{5}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n .

$$y^{\frac{12}{4}}$$

$$n = -12$$

$$(y^3)^{-4}$$

$$y^{-12}$$

Score 1: The student made a computational error.

Question 28

28 Given that $\left(\frac{\frac{17}{8}}{\frac{y}{5}}\right)^{-4} = y^n$, where $y > 0$, determine the value of n .

$$\left(\frac{4\frac{17}{8}}{4\frac{10}{8}}\right)^{-4}$$

Score 0: The student did not show enough correct work to receive any credit.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

$$\frac{\sin A}{\cos A} = \frac{1}{\cot A}$$

$$\cos A = \frac{3 \text{ adj.}}{\sqrt{10} \text{ hyp.}}$$

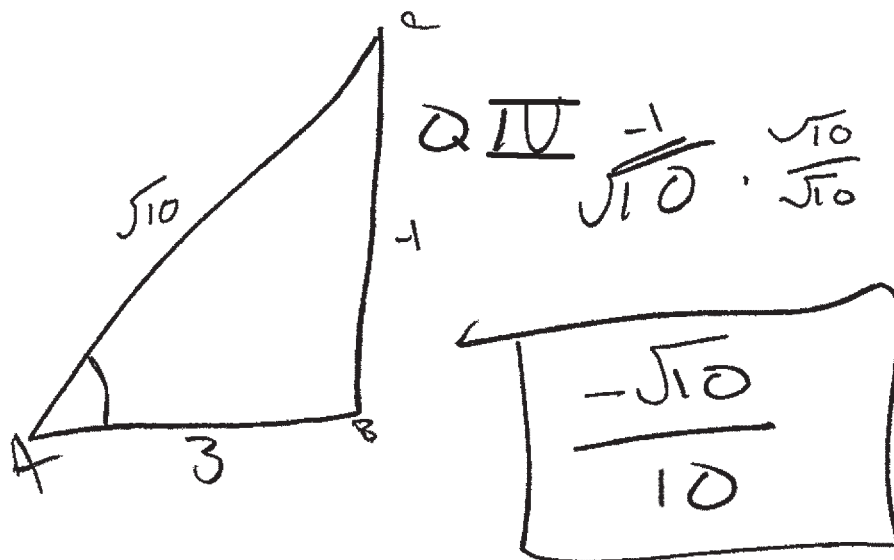
$$\cot A = \frac{3 \text{ adj.}}{-1 \text{ opp.}}$$

$$\sin A = \frac{-1}{\sqrt{10}}$$

Score 2: The student gave a complete and correct response.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.



Score 2: The student gave a complete and correct response.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.



$$3^2 + b^2 = \sqrt{10}^2 -$$

$$\frac{9}{-9} + b^2 = 10$$

$$\frac{-9}{-9}$$
$$\sqrt{b^2} = \sqrt{1}$$

$$b = 1$$

$$\sin A = \frac{1 \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{\sqrt{10}}{10}$$

Score 1: The student ignored the sign of the function in Quadrant IV.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

$$\cos A = \frac{3}{\sqrt{10}}$$

$$(\cos(A))^2 + (\sin(A))^2 = 1$$

$$\left(\frac{3}{\sqrt{10}}\right)^2 + (\sin(A))^2 = 1$$

$$0.9 + (\sin(A))^2 = 1$$

$$\sqrt{(\sin(A))^2} = \sqrt{0.1}$$

$$\sin A = \sqrt{0.1}$$

Score 1: The student ignored the sign of the function in Quadrant IV.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

$$\frac{\cos}{\sin}$$

$$\sin A = -.316$$

$$-3 = \frac{\frac{3}{\sqrt{10}}}{x}$$

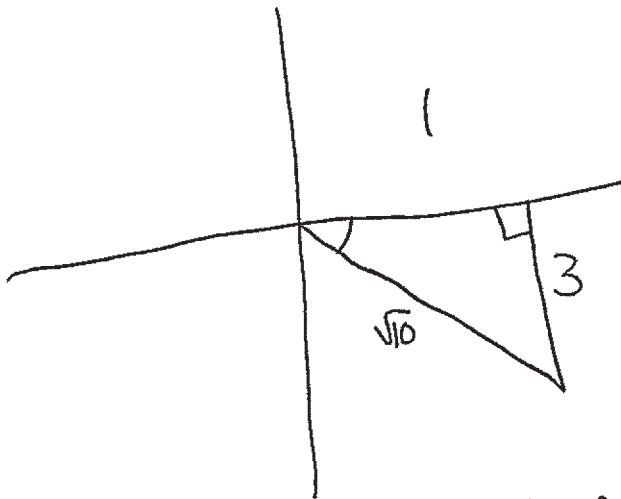
$$-3x = \frac{3}{\sqrt{10}}$$

$$\frac{-3x}{-3} = \frac{.948}{-3}$$

Score 1: The student did not give the value in radical form.

Question 29

29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.



$$\sin A = \frac{(1)^2}{(\sqrt{10})^2}$$

$$\sin A = \frac{1}{10}$$

$$\begin{aligned} 9 + x^2 &= 10 \\ -9 & \quad -9 \\ \hline \sqrt{x^2} &= \sqrt{1} \\ x &= 1 \end{aligned}$$

Score 0: The student made multiple errors.

Question 30

- 30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

$$\text{normalcdf}(4, 100000, 3.39, .55) = 0.1336\dots$$

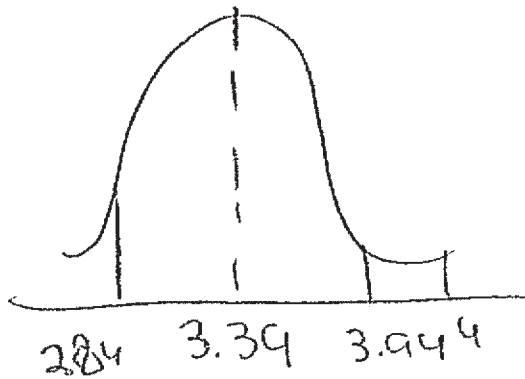
$$0.1336\dots \cdot 9256 =$$

1,237 babies born
last year weighed more
than 4 kg.

Score 2: The student gave a complete and correct response.

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.



Normal CDF:

LB: 4

UB: ∞

μ : 3.39

σ : .55

1237 babies

Score 2: The student gave a complete and correct response.

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is $\overset{\text{mean}}{3.39}$ kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

$$\begin{aligned} &\text{normal cdf}(4, 1000, 3.39, 0.55) \\ &0.1336955 \times 100 = 13.36955\% \\ &9256 \times \uparrow = 1238 \text{ babies} \end{aligned}$$

Score 1: The student rounded incorrectly.

Question 30

30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the *nearest integer*, approximately how many babies weighed more than 4 kg.

normal cdf(4, ∞, 0.55, 3.39)

1388 babies

Score 0: The student did not show enough correct work to receive any credit.

Question 31

- 31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical
Male	39	17	42	12
Female	17	37	36	15

215

$$P(F \text{ and } CR) = P(F) \cdot P(CR)$$

$$\frac{36}{215} = \frac{105}{215} \cdot \frac{78}{215}$$

$$0.1674418605 \neq 0.1771768524$$

$$P(F|CR) = P(F)$$

$$\frac{36}{78} = \frac{105}{215}$$

$$0.4615384615 \neq 0.488372093$$

No, the events are not independent of each other because the probabilities are different

Score 2: The student gave a complete and correct response.

Question 31

31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical	
Male	39	17	42	12	110
Female	17	37	36	15	105
	56	54	78	27	215

$$A | B = A$$

$$\frac{105}{215} = .488372093$$

$$\frac{36}{78} = .4615384615$$

no, not independent

Score 2: The student gave a complete and correct response.

Question 31

31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

Independence

	Rap	Techno	Classic Rock	Classical	
Male	39	17	42	12	110
Female	17	37	36	15	105

$$P(A) = P(B|A) \quad \text{!!!!}$$

$$\frac{105}{215} = \frac{36}{105}$$

$$\cdot 488 \times \cdot 34285 \times$$

$$P(B) = P(A|B)$$

$$\frac{78}{215} = \frac{36}{78}$$

$$\times \cdot 36279 \times \cdot 46$$

The events “the person is female” and “the person prefers classic rock” are not independent of each other because using the equation $P(A) = P(B|A)$ the probabilities are not equal.

Score 1: The student stated a correct conclusion based on an incorrect test for independence.

Question 31

- 31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical
Male	39	17	42	12
Female	17	37	36	15

Classic rock

$$M = \frac{42}{110} \times 100$$

$$F = \frac{36}{105} \times 100$$

M = % of males that like classic rock

F = % of females that like classic rock

$$M = 38.18\%$$

$$F = 34.28\%$$

Females are not more likely to like classic rock, so the events are independent.

Score 0: The student did not show enough correct relevant work to receive any credit.

Question 31

31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical	
Male	39	17	42	12	110
Female	17	37	36	15	105
	56	54	78	27	215

Not independent

$$P(A) + P(B) = P(A \cap B)$$

$$\frac{105}{215} + \frac{78}{215} = \frac{15}{27}$$

$$.488 + .3627 = .8507$$

✓
.8511

Score 0: The student made multiple errors.

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x$$

$$\begin{array}{r} 2x^2 - 7x + 4 = 11 - 2x \\ + 2x - 11 \quad - 11 + 2x \end{array}$$

$$2x^2 - 5x - 7 = 0$$

$$(2x - 7)(x + 1) = 0 \quad -7x + 2x$$

$$2x - 7 = 0$$

$$x + 1 = 0$$

$$2x = 7$$

$$x = -1$$

$$x = \frac{7}{2}$$

$$y = 11 - 2(-1)$$

$$y = 11 - 2\left(\frac{7}{2}\right)$$

$$y = 11 + 2$$

$$= 11 - \frac{14}{2}$$

$$y = 13$$

$$= \frac{22 - 14}{2}$$

solution

$$= \frac{8}{2}$$

$$x, y(-1, 13)$$

$$y = 4$$

$$x, y\left(\frac{7}{2}, 4\right)$$

Score 2: The student gave a complete and correct response.

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x \quad y = 11 - 2x$$

$$y = 11 - 2(3.5) \text{ or } y = 11 - 2(-1)$$

$$11 - 2x = 2x^2 - 7x + 4 \quad y = 4 \text{ or } y = 13$$

$$-11 + 2x \quad +2x - 11$$

$$2 \cdot -7 = \underline{-14}$$

$$0 = 2x^2 - 5x - 7$$

$$2x^2 + 2x \quad -7x - 7$$

$$+7 + 2$$

$$2x(x+1) - 7(x+1)$$

$$(2x - 7)(x + 1)$$

$$(3.5, 4) \quad (-1, 13)$$

$$2x - 7 = 0 \quad x + 1 = 0$$

$$+7 \quad +7$$

$$\frac{2x = 7}{2} \quad \text{or } x = -1$$

$$x = 3.5$$

Score 2: The student gave a complete and correct response.

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x$$

$$\begin{array}{r} 11 - 2x = 2x^2 - 7x + 4 \\ -11 + 2x \quad -11 + 2x \end{array}$$

$$0 = 2x^2 - 5x - 7$$

$$\begin{array}{c} 0 = (2x - 7)(x + 1) \\ \hline \begin{array}{|c|} \hline 2x = 7 \\ \hline x = \frac{7}{2} \\ \hline \end{array} \quad \begin{array}{|c|} \hline x = -1 \\ \hline \end{array} \end{array}$$

$$x = -1, \frac{7}{2}$$

$$y = 4, 13$$

Score 1: The student did not clearly indicate the solution set.

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x$$

$$y = 11 - 2(3.5)$$

$$y = 4$$

$$11 - 2x = 2x^2 - 7x + 4$$

$$0 = 2x^2 - 5x - 7$$

$$2x^2 - 7x | + 2x - 7$$

$$x(2x-7) + 1(2x-7)$$

$$(x+1)(2x-7)$$

$$x+1=0$$

$$x = -1$$

$$2x-7=0$$

$$\frac{2x}{2} = \frac{7}{2}$$

$$x = 3.5$$

$$(3.5, 4)$$

$$\begin{array}{r} -14 \\ \wedge \\ -7 \quad 2 \end{array}$$

Score 1: The student did not find both solutions.

Question 32

32 Algebraically determine the solution set for the system of equations below.

$$y = 2x^2 - 7x + 4$$

$$y = 11 - 2x$$

$$11 - 2x = 2x^2 - 7x + 4$$

$$2x^2 + 5x - 7 = 0$$

$$2x^2 + 2x + 7x - 7 = 0$$

$$2x(x-1) + 7(x-1) = 0$$

$$(2x+7)(x-1) = 0$$

$$x = \frac{7}{2} \quad x = -1$$

$$y = 11 - 2\left(\frac{7}{2}\right) \rightarrow 4$$

$$y = 11 - 2(1) \rightarrow 9$$

$$\left(\frac{7}{2}, 4\right)$$

$$(1, 9)$$

Score 0: The student made multiple computational errors.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11,000 \left(2\right)^{\frac{t}{20}}$$

- b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1,000,000 = 11,000 \left(2\right)^{\frac{t}{20}}$$

$$90.90909 = 2^{\frac{t}{20}}$$

$$\log 90.90909 = \log 2^{\frac{t}{20}}$$

$$= \frac{t}{20} \log 2$$

$$t = \frac{20 \log 90.90909}{\log 2} \approx 130.13$$

Score 4: The student gave a complete and correct response.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$A = Pe^{rt}$$

$$\ln 2 = \frac{e^{20r}}{1}$$

$$\ln 2 = 20r$$

$$r = \frac{\ln 2}{20}$$

$$p(t) = 11,000 e^{\left(\frac{\ln 2}{20}\right)t}$$

- b) Using $p(t)$ from part a, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1,000,000 = 11,000 e^{\left(\frac{\ln 2}{20}\right)t}$$

$$\ln 90.91 = \frac{\ln 2}{20} t$$

$$\ln 90.91 = \frac{\ln 2 t}{20}$$

$$\frac{(\ln 90.91)(20)}{\ln 2} = \frac{\ln 2 t}{\ln 2}$$

$$t = 130.13 \text{ minutes}$$

Score 4: The student gave a complete and correct response.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11000(2)^t$$

- b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$11000(2)^t = 1000000$$

$$\log 2^t = \frac{\log 1000000}{\log 11000}$$

$$t = \frac{\log \frac{1000000}{11000}}{\log 2}$$

$$t = 6.51$$

Score 3: The student made an error in the exponent in part *a*.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11,000(2)^{\frac{t}{20}}$$

- b) Using $p(t)$ from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1,000,000 = 22,000(2)^{\frac{t}{20}}$$

$$\frac{\log(1,000,000)}{\log(22,000)} = \frac{\frac{t}{20} \log(22,000)}{\log(22,000)}$$

$$\frac{1.381717175}{1} = \frac{t}{20}$$

$$t = 27.6343435$$

$$t = 27.6 \text{ minutes}$$

Score 2: The student multiplied 11,000 by 2 and made a rounding error.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11,000(2)^{\frac{t}{20}}$$

b) Using $p(t)$ from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$\frac{1,000,000}{11,000} = \frac{11,000(2)^{\frac{t}{20}}}{11,000}$$

$$90.909 \approx 2^{\frac{t}{20}}$$

$$1.75 = 2^{\frac{t}{20}}$$

$$t \approx 130.67$$

Handwritten work for part a:

$$2^0 = 11,000$$

$$2^1 = 22,000$$

$$2^2 = 44,000$$

$$2^3 = 88,000$$

$$2^4 = 176,000$$

$$2^5 = 352,000$$

$$2^6 = 704,000$$

$$2^7 = 1,408,000$$

Score 2: The student only received credit for part a.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11,000(1 + 2)^{\frac{t}{20}}$$

- b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1,000,000 = 11,000(1 + 2)^{\frac{t}{20}}$$

$$90.909 = (1 + 2)^{\frac{t}{20}}$$

$$90.909 = (3)^{\frac{t}{20}}$$

Score 1: The student had an incorrect base in part *a* and did not show enough further correct work.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11000(2)^{\frac{t}{20}}$$

$t = \text{every } 20 \text{ mins}$

- b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$6.51 \times 20$$

$$130.20 \text{ minutes}$$

Score 1: The student received 1 credit for the equation in part *a*.

Question 33

33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

- a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, p , on a smartphone screen, where t represents the time in minutes after it is first observed under a microscope.

$$P = 11,000 \cdot \left(\frac{1}{2}\right)^t$$

- b) Using $p(t)$ from part *a*, determine algebraically, to the *nearest hundredth of a minute*, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$\begin{aligned} 1,000,000 &= 11,000 \left(\frac{1}{2}\right)^t \\ 1,000,000 &= 22,000^t \end{aligned}$$

$$\log_{22,000}(1,000,000) = t$$

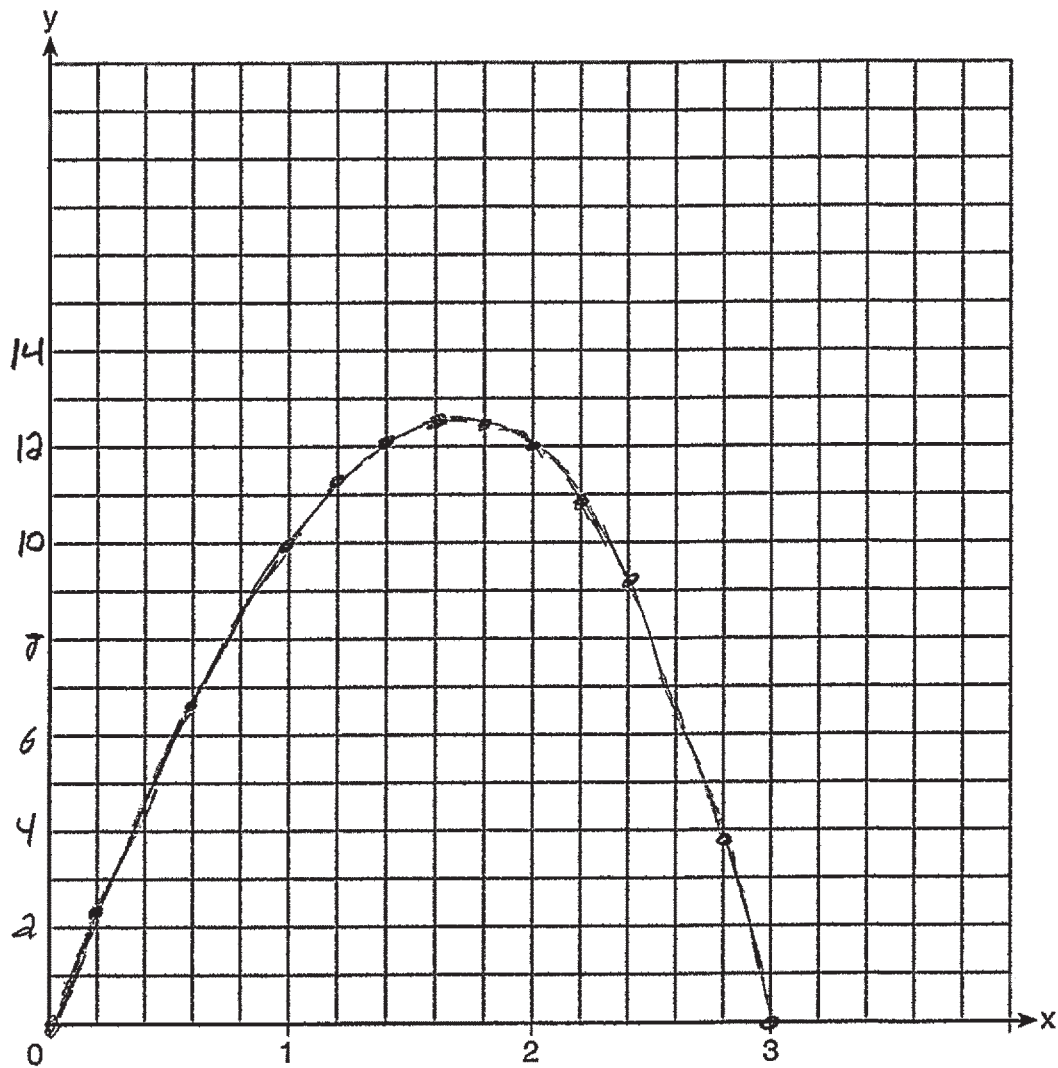
$$t = 138.17 \text{ minutes}$$

Score 0: The student made multiple errors in the equation and solution.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

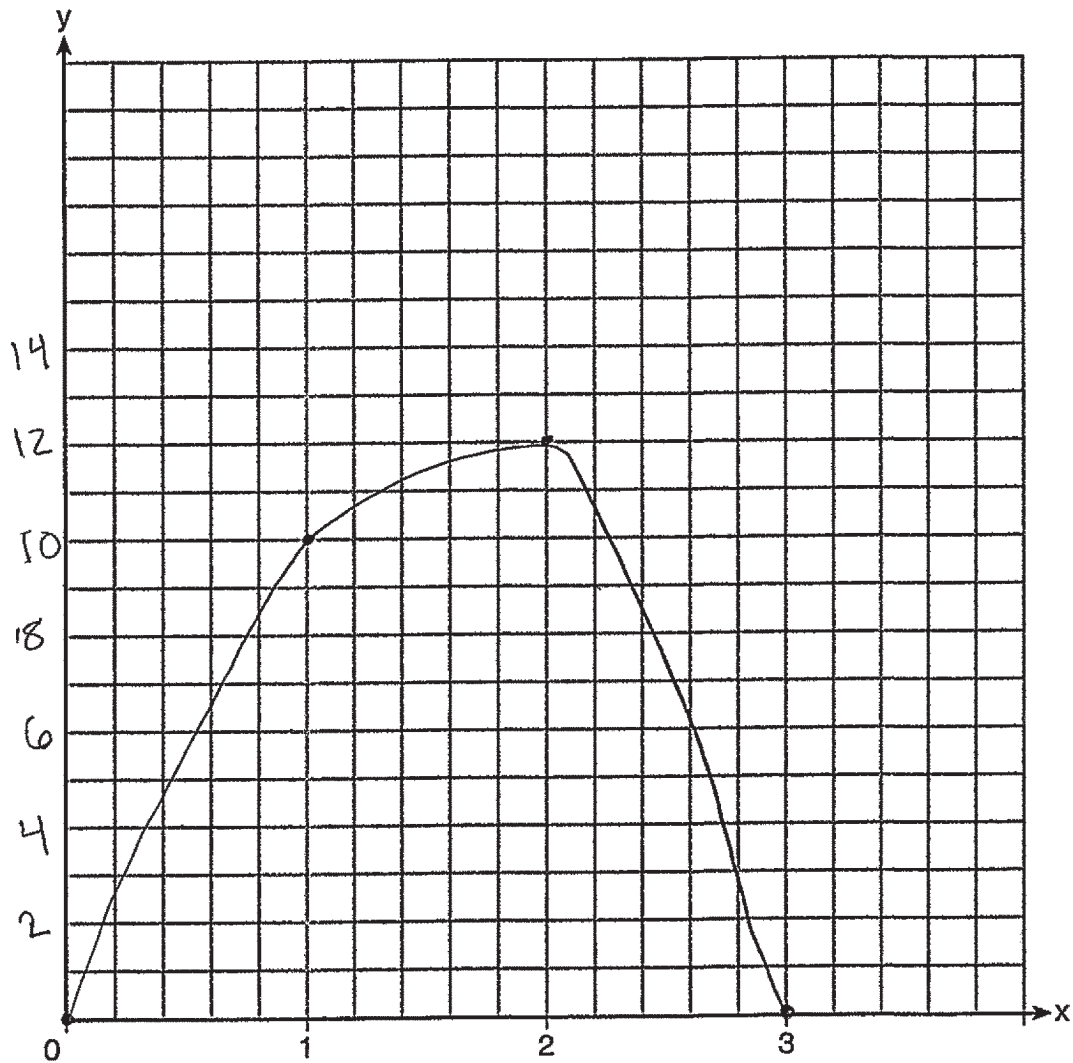
12.6

Score 4: The student gave a complete and correct response.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

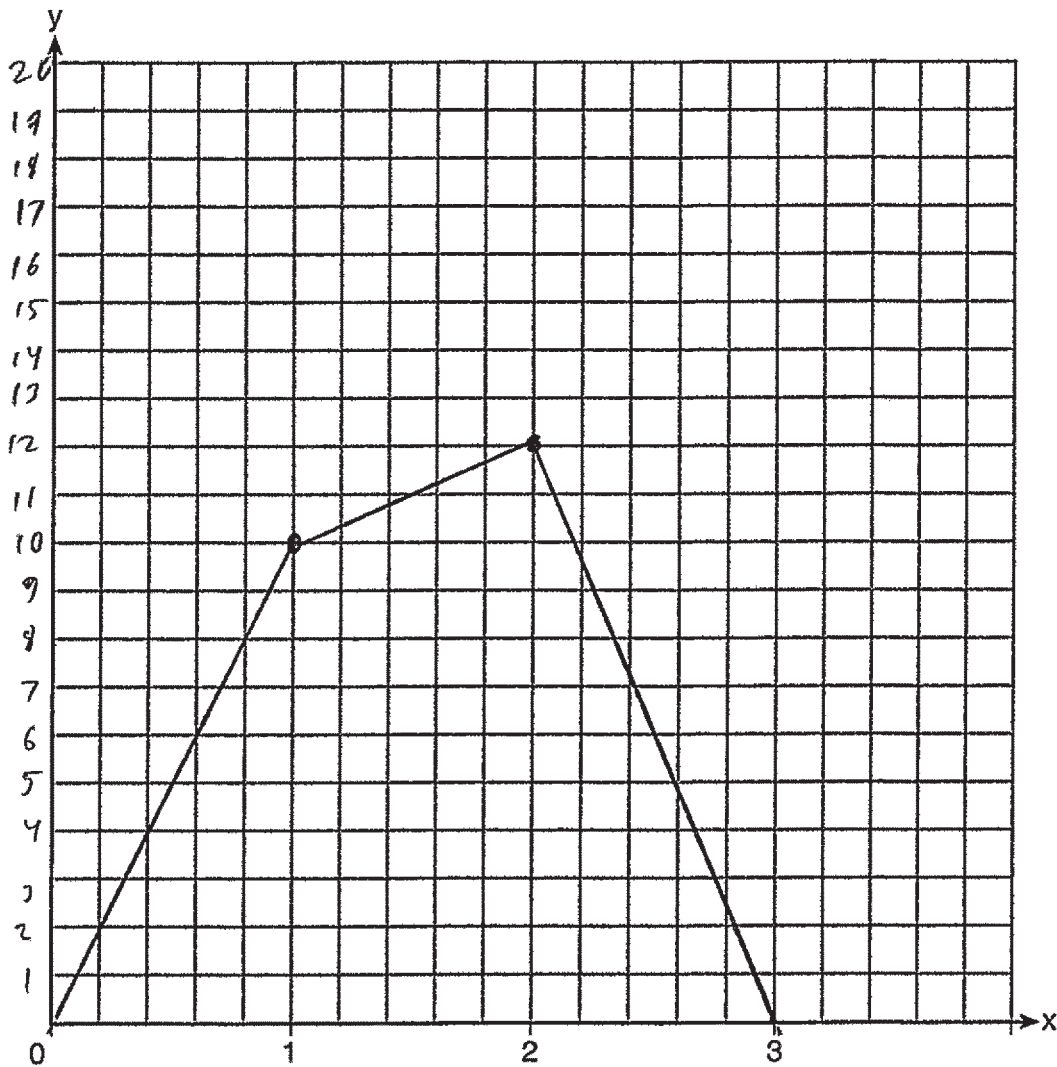
Max = 12.6

Score 3: The student made a graphing error at the maximum.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

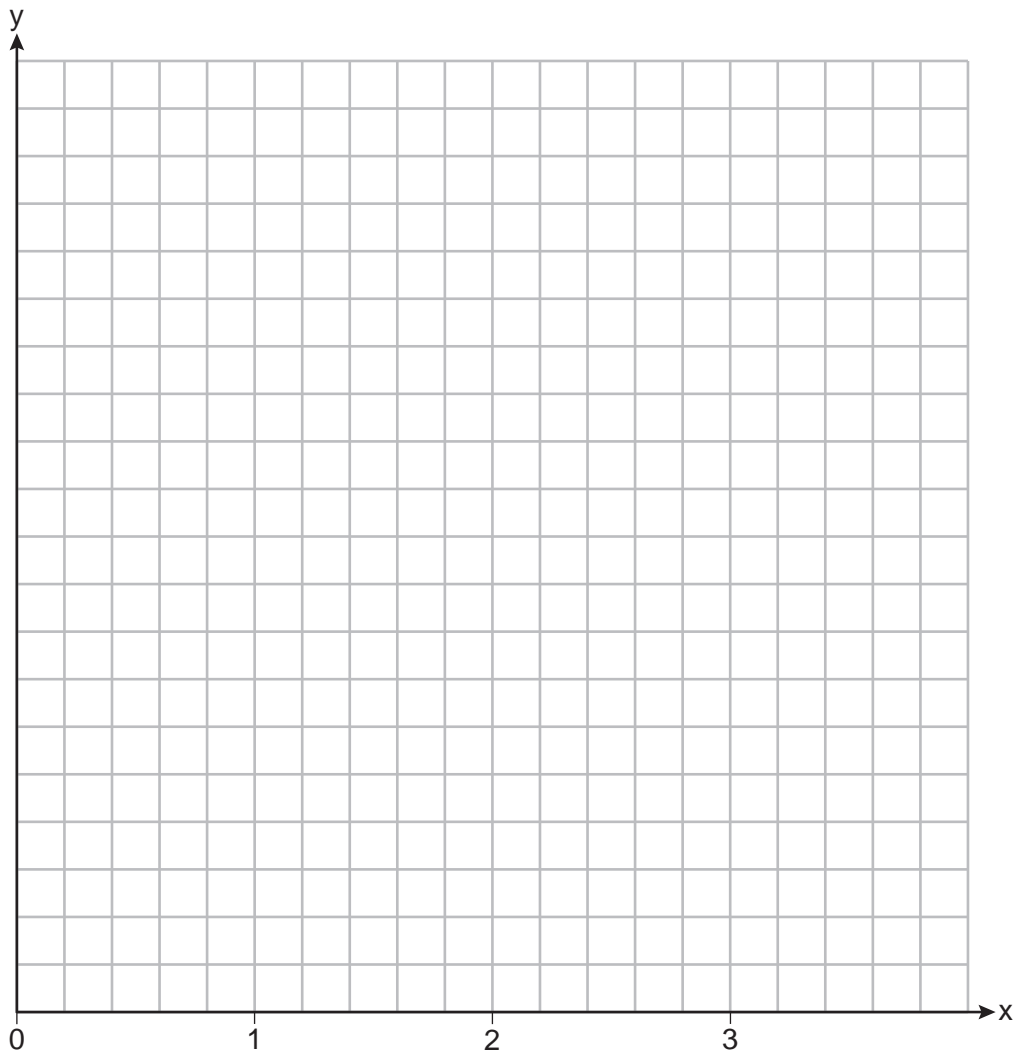
It is 12.6.

Score 2: The student only received credit for stating the maximum.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

(1.7, 12.6)

Score 1: The student stated the coordinates of the maximum.

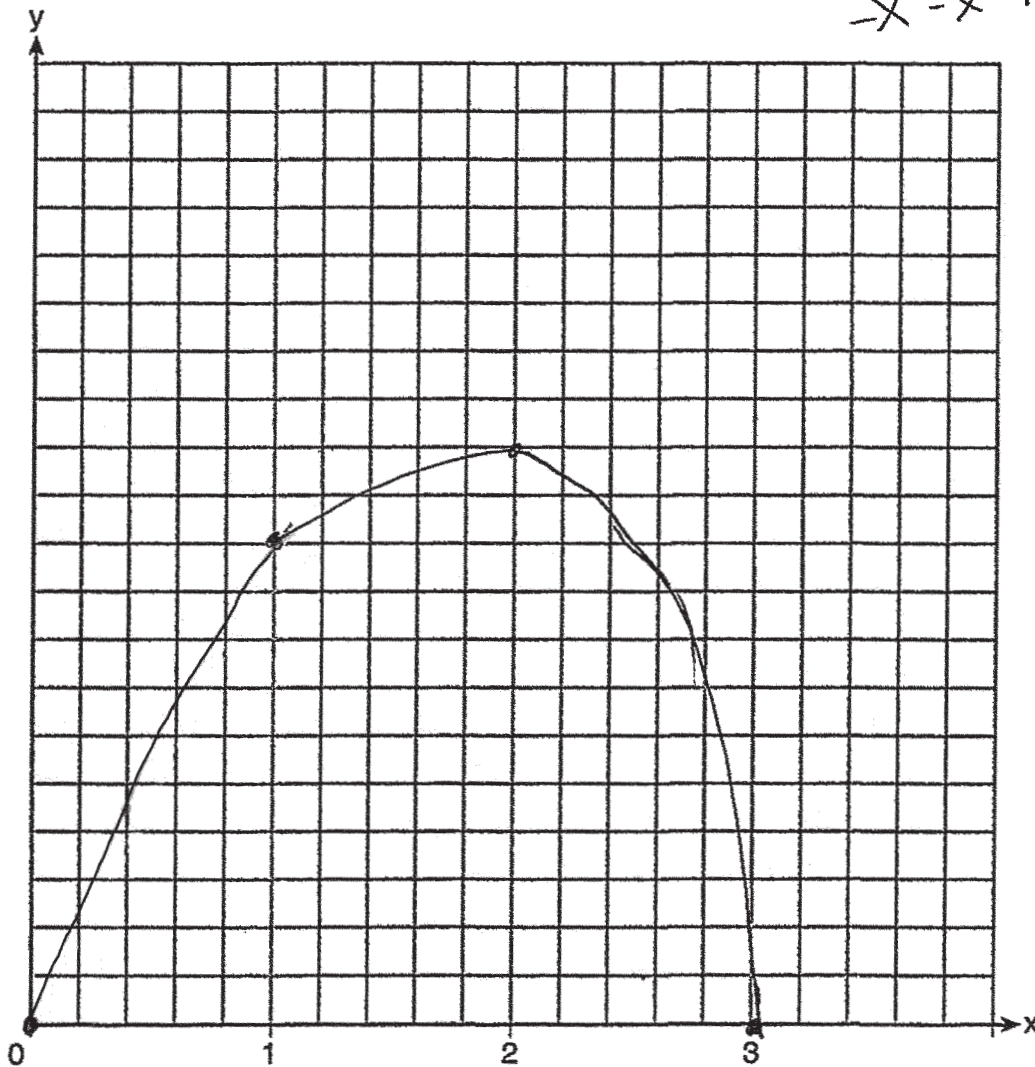
Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.

$$\begin{array}{|c|c|} \hline 3 & -x \\ \hline 3x & -x^2 \\ \hline 12 & -4x \\ \hline \end{array} + 4 \begin{array}{l} x \\ x \end{array} \begin{array}{l} (-x^2 - x + 12) \\ \end{array}$$

$$-x^3 - x^2 + 12x$$



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

$$\begin{array}{l} x(-x^2 - x + 12) \\ (x-4)(x+3) \\ x=4 \quad x=-3 \end{array}$$

48.7

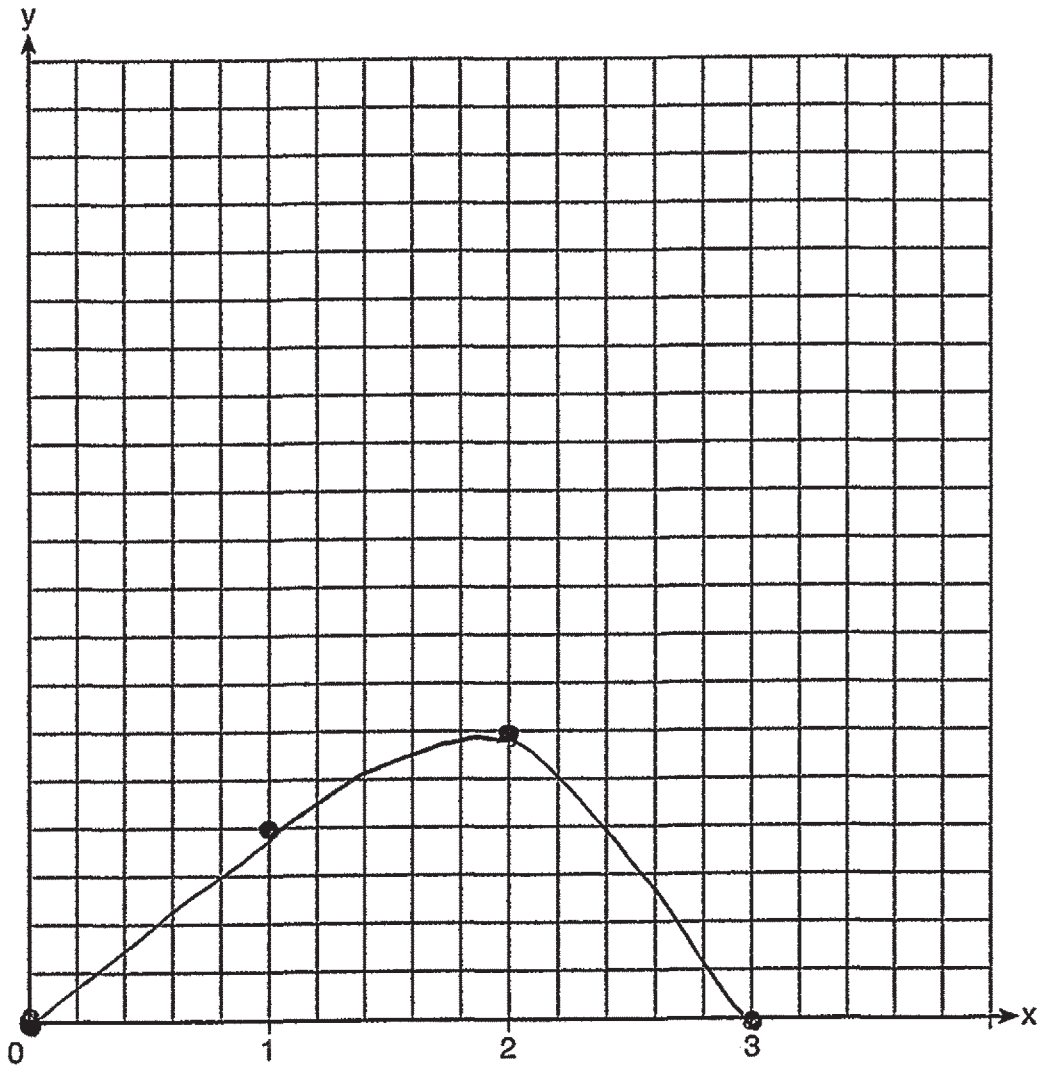
$$\begin{array}{l} -4 \\ -12 \\ -1 \end{array}$$

Score 1: The student did not graph the correct maximum and showed no further correct work.

Question 34

34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.



To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

The maximum volume was 12.0.

Score 0: The student made multiple graphing errors and the maximum is incorrectly stated.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r}
 3x^2 + 8x + 34 \\
 x-4 \overline{) 3x^3 - 4x^2 + 2x - 1} \\
 \underline{-(3x^3 - 12x^2)} \\
 8x^2 + 2x \\
 \underline{-(8x^2 - 32x)} \\
 34x - 1 \\
 \underline{-(34x - 136)} \\
 135
 \end{array}$$

$$3x^2 + 8x + 34 + \frac{135}{x-4}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

no, because when you divide ^{by $x-4$} you get a remainder of 135 and not a remainder of 0.

Score 4: The student gave a complete and correct response.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r}
 4 \overline{) 3 \quad -4 \quad 2 \quad -1} \\
 \underline{12 \quad 32 \quad 136} \\
 3 \quad 8 \quad 34 \quad 135
 \end{array}$$

$$3x^2 + 8x + 34 + \frac{135}{x-4}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

no because when $f(x)$ was divided by $x-4$ there was a remainder

Score 4: The student gave a complete and correct response.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r}
 3x^2 + 8x + 34 \\
 x-4 \overline{) 3x^3 - 4x^2 + 2x - 1} \\
 \underline{-3x^3 - 12x^2} \\
 8x^2 + 2x - 1 \\
 \underline{-8x^2 - 32x} \\
 34x - 1 \\
 \underline{-34x - 136} \\
 135
 \end{array}$$

$$\boxed{3x^2 + 8x + 34 \frac{135}{x-4}}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

NO. when 4 is substituted for x , it does not equal to zero meaning it is not a root

Score 3: The student did not write the quotient and remainder in the correct form.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r}
 3x^2 - 16x - 62 \\
 \hline
 x-4 \overline{) 3x^3 - 4x^2 + 2x - 1} \\
 \underline{- 3x^3 + 12x^2} \\
 -16x^2 + 2x \\
 \underline{- -16x^2 + 64x} \\
 -62x - 1 \\
 \underline{- -62x + 248} \\
 -249
 \end{array}$$

$3x^2 - 16x - 62 = \frac{249}{x-4}$

Is $x = 4$ a root of $f(x)$? Explain your answer.

No, $x = 4$ is not a root of $f(x)$ because there is a remainder.

Score 3: The student made a computational error in the long division.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r} 3x^3 - 4x^2 + 2x - 1 \\ \hline x - 4 \end{array}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

No it is not
Because $f(4)$ does not
equal zero.

Score 2: The student wrote a correct explanation but showed no further correct work.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r} 3x^3 - 4x^2 + 2x - 1 \\ \hline x - 4 \\ -x^2 \end{array}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

$$\begin{aligned} f(4) &= 3(4)^3 - 4(3)^2 + 2(4) - 1 \\ &= 163 \end{aligned}$$

NO, because $f(4) \neq 0$

Score 1: The student received one credit for the explanation.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r} g(x) = x - 4 \\ \hline \text{Answer: } 4x^2 + 12x + 50 + \frac{199}{x-4} \end{array}$$

$$\begin{array}{r} 4 \overline{) 3 \ -4 \ 2 \ -1} \\ \underline{1 \ 16 \ 48 \ 200} \\ 4 \ 12 \ 50 \ 199 \\ \hline 4x^2 + 12x + 50 \end{array}$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

Score 1: The student has one computational error in the synthetic division and showed no further correct work.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$g(x) = x - 4$$

$$F(x) = 3x^3 - 4x^2 + 2x - 1$$

$$F(x) = 3x^3 - 4x^2 + 2(-4) - 1$$

$$F(x) = 3x^3 - 4x^2 - 8 - 1$$

$$F(x) = 3x^3 - 4x^2 - 9$$

Is $x = 4$ a root of $f(x)$? Explain your answer.

NO because it can't go in to 0.

Score 0: The student did not show enough correct work to receive any credit.

Question 35

35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$$\begin{array}{r}
 \begin{array}{l}
 3x^2 - 4x + 2 \\
 \hline
 3x^3 - 4x^2 + 2x - 1 \\
 - 3x^3 \\
 \hline
 0 - 4x^2 + 2x - 1 \\
 - 4x^2 + 8x - 4 \\
 \hline
 0 + 2x - 1 \\
 - 2x + 8 \\
 \hline
 0 - 1 \\
 \hline
 -1
 \end{array} \\
 + x + 4 \overline{) 3x^3 - 4x^2 + 2x - 1}
 \end{array}$$

$$3x^2 - 4x + 2 + \frac{-1}{x + 4}$$

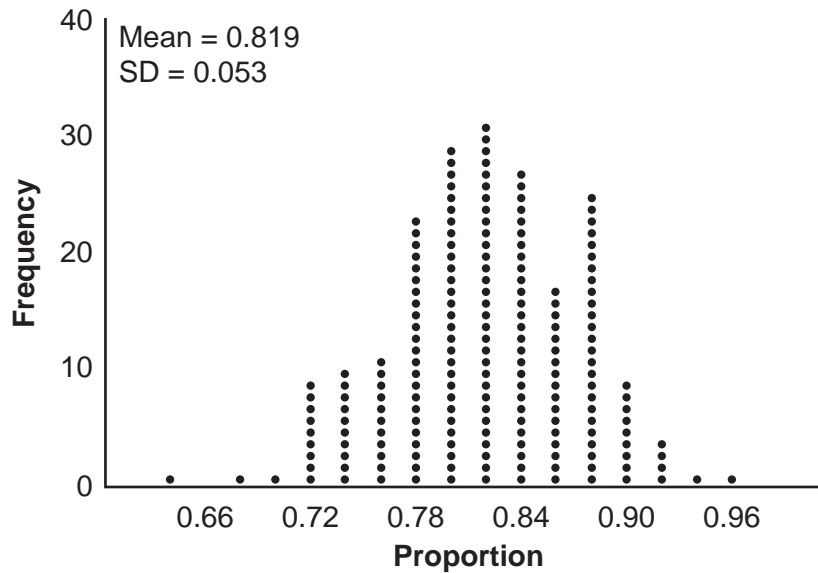
Is $x = 4$ a root of $f(x)$? Explain your answer.

NO, bc, $f(x) = 0$ cant be graphed, the roots would be imaginary.

Score 0: The student did not show enough correct work to receive any credit.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$$0.819 \pm 2(.053)$$
$$0.713 - 0.925$$

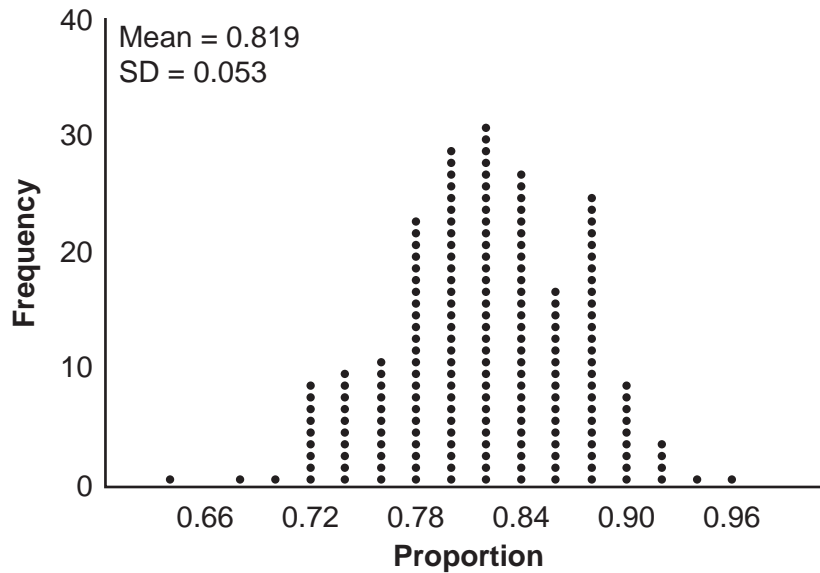
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

71.3% - 92.5%
The organization should question the state officials claim because 70% is outside of the 95% interval.

Score 4: The student gave a complete and correct response.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$95\% \pm 2$

$$\begin{array}{r} .053 \\ \times 2 \\ \hline .106 \end{array}$$

$$\begin{array}{r} .819 \\ -.106 \\ \hline .713 \end{array} \quad \begin{array}{r} .819 \\ +.106 \\ \hline .925 \end{array}$$

$.713 - .925$

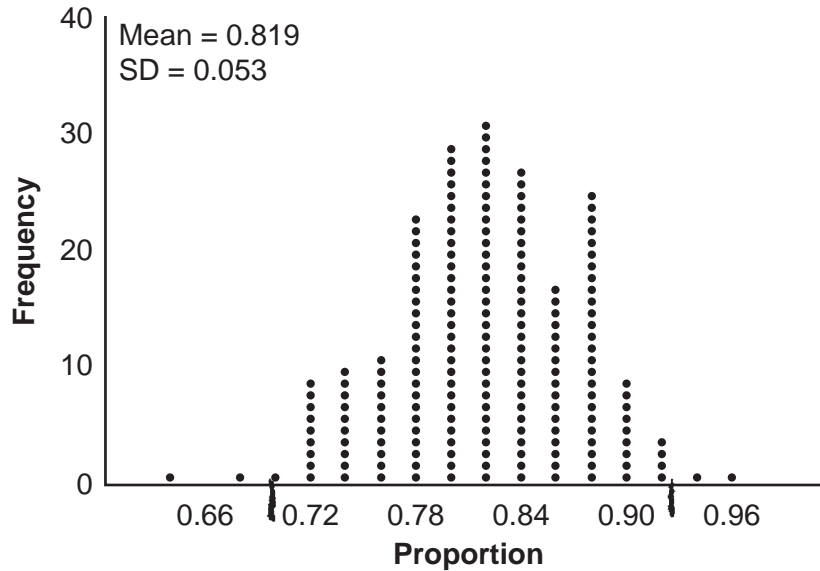
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

They should question the claim because their survey results are outside the range of plausible proportions.

Score 4: The student gave a complete and correct response.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

$$0.819 \pm 2(0.053) < \begin{matrix} 0.819 + 2(0.053) = 0.925 \\ 0.819 - 2(0.053) = 0.713 \end{matrix}$$

$$\boxed{0.713 \pm 0.925}$$

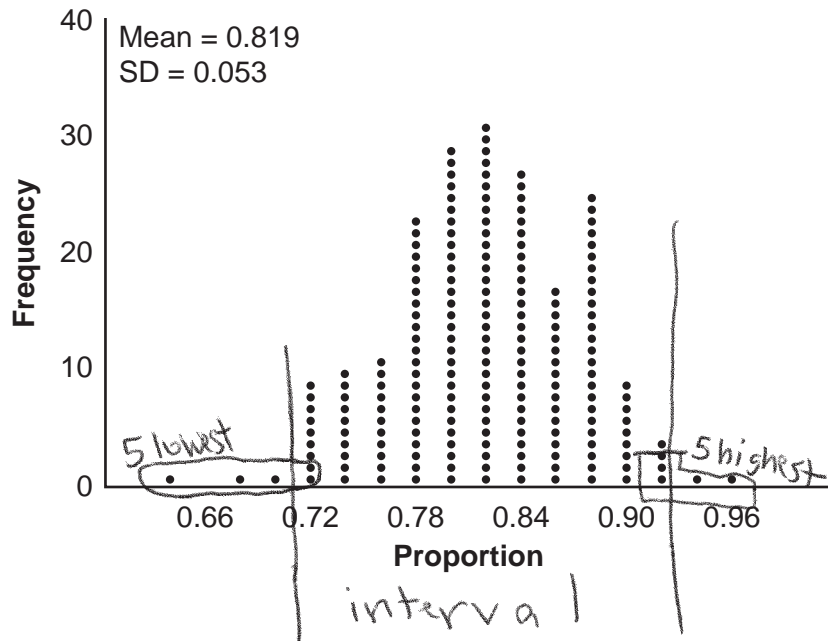
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

The organization should question the state officials claim because this 70% support does not fall into the 95% plausible proportions (lower main 71.3%)

Score 3: The student did not state a correct interval.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$$.72 - .92$$

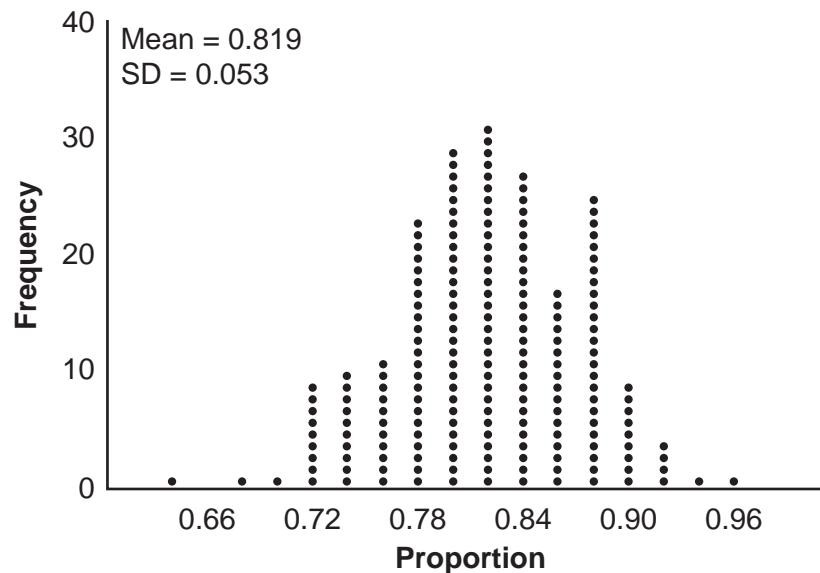
The community organization conducted its own sample survey of 60 people and found ^{.70}70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

The officials' claim should be questioned because .70 is outside the interval .72-.92.

Score 3: The student did not round the interval to the nearest thousandth.

Question 36

- 36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$$(.819) + 2(.053) = .925$$
$$(.819) - 2(.053) = .713$$

$$\boxed{.713 - .925}$$

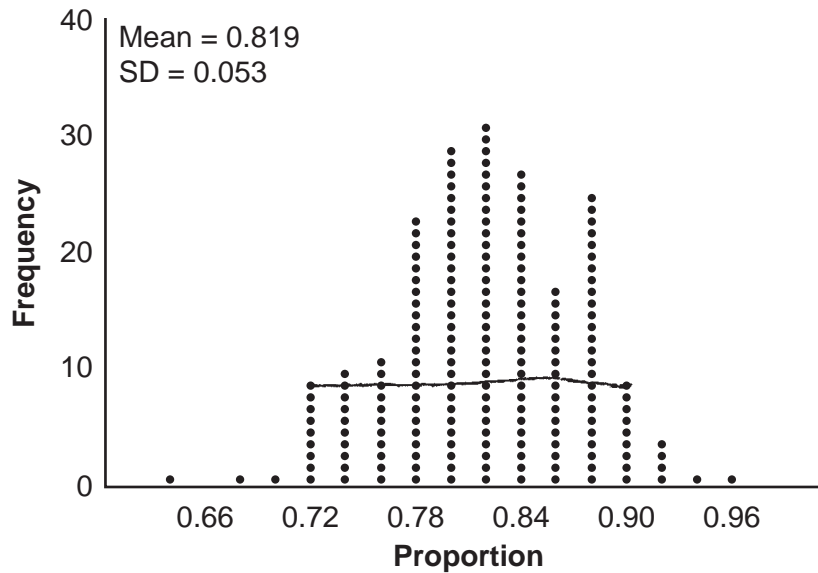
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

70% is lower than the mean of 81.9%

Score 2: The student stated a correct interval but showed no further correct work.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$$0.819 \pm 2(0.053)$$

$$= 0.925$$

$$= 0.713$$

0.925 0.713

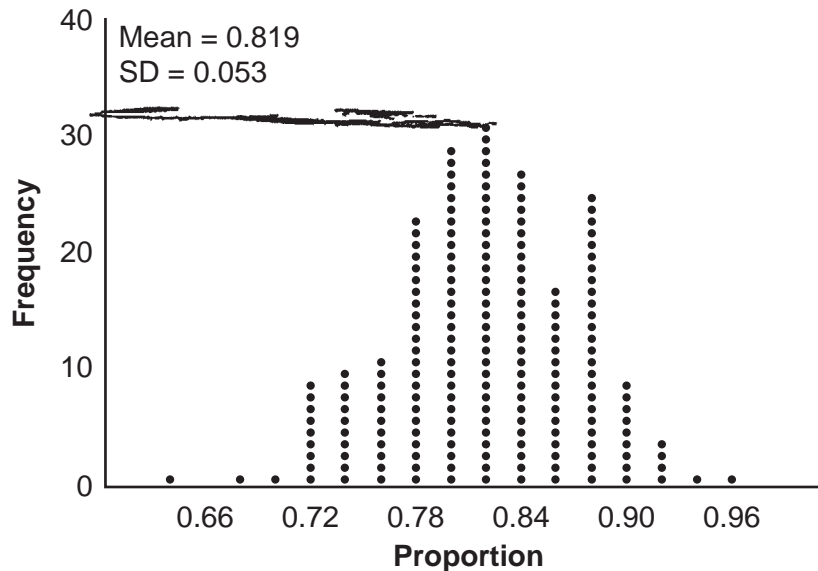
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

Because the dot graph does not show that 70% supported the repeal.

Score 1: The student wrote the interval incorrectly.

Question 36

36 State officials claim 82% of a community want to repeat the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$$\frac{31\%}{95\%} = \frac{.31}{.0095} = \boxed{32.6}$$

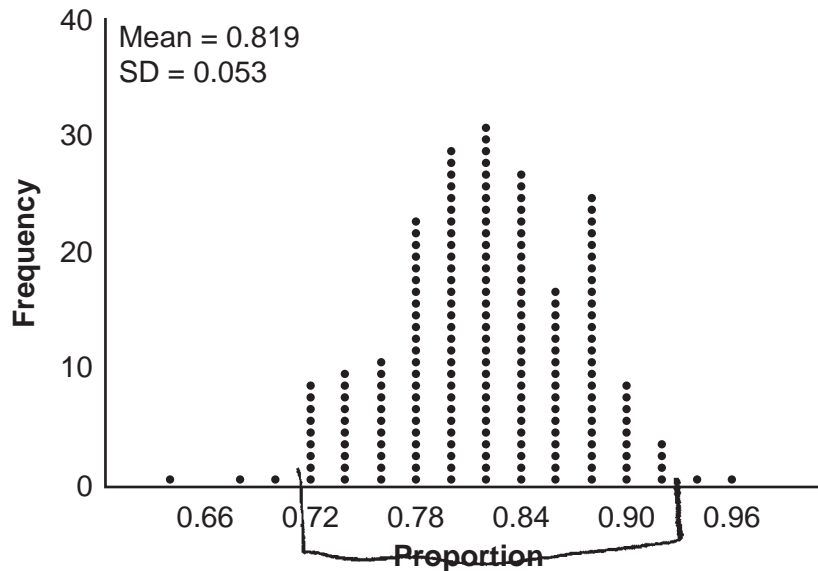
The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

They should question the state officials claim because it is wrong and it states that 70% of the community supported the repeal.

Score 0: The student did not show enough correct work to receive any credit.

Question 36

36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*.

$$0.72 - 0.90$$

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

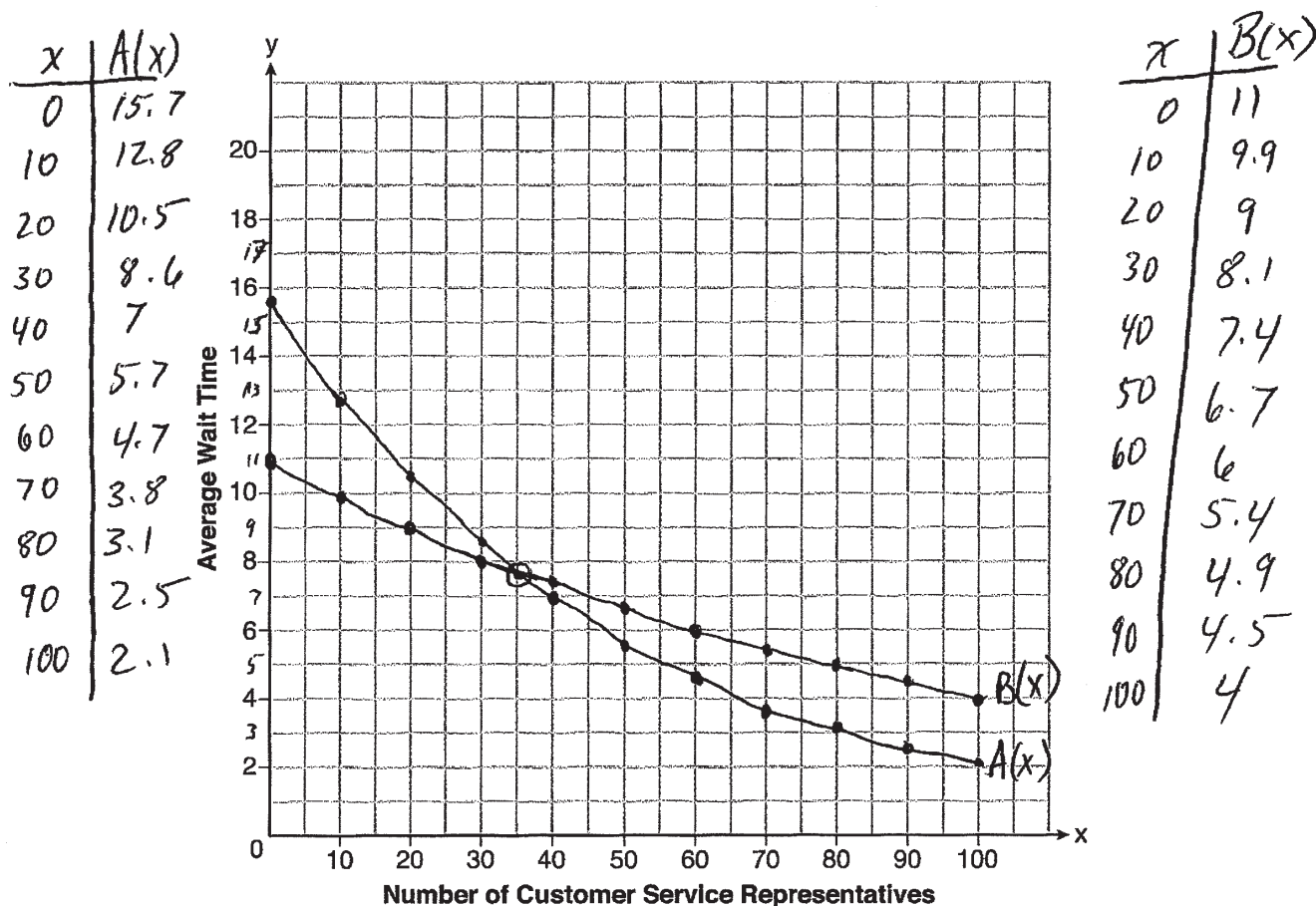
The organization should question the State officials claim because they had a 12% difference in results.

Score 0: The student did not give a correct interval and wrote an incorrect explanation.

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 6: The student gave a complete and correct response.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$x = 35$$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$$B(100) = 4.0264$$

$$A(100) = -2.0812$$

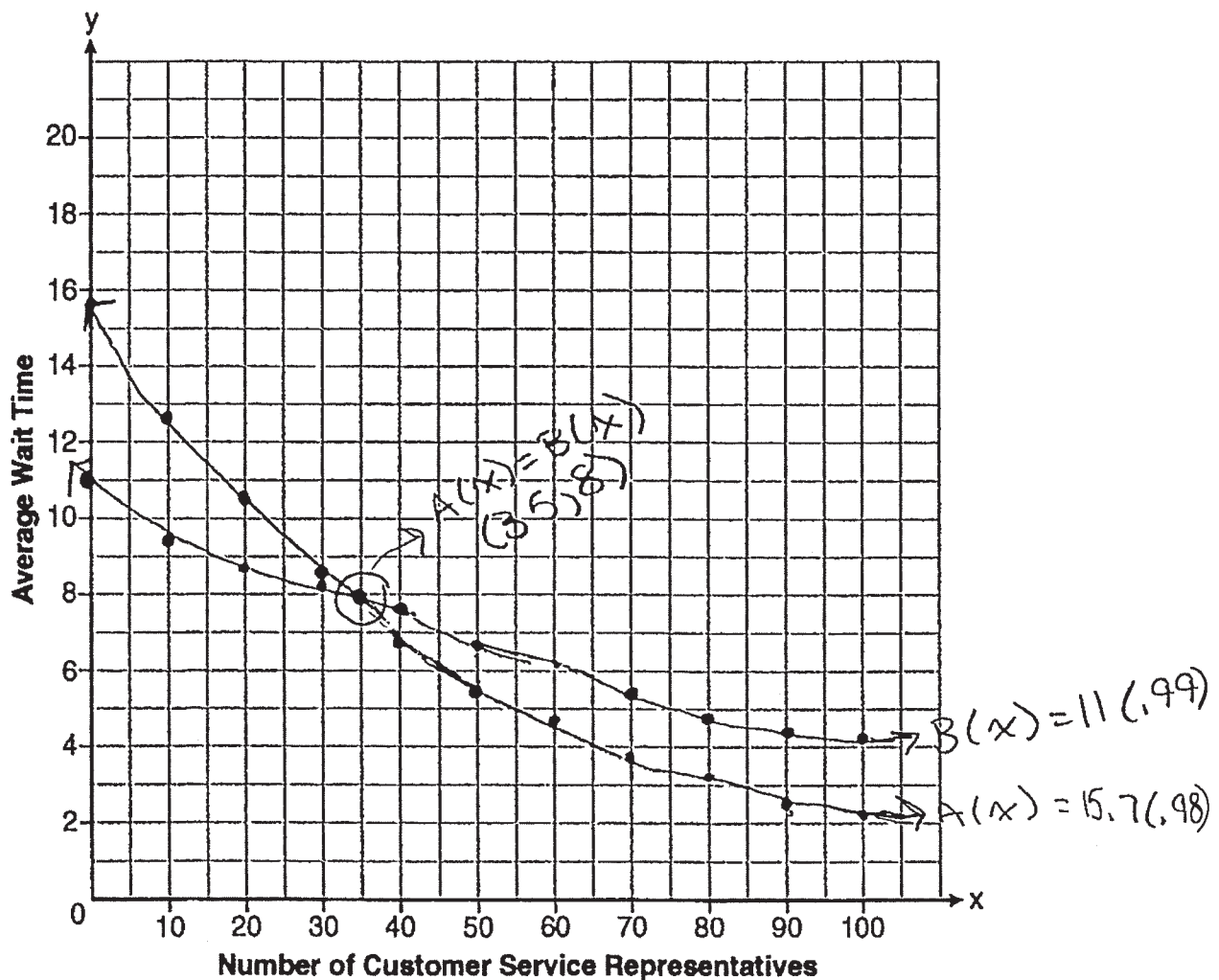
$$1.9 \approx \boxed{2 \text{ min}}$$

For 100 customer Service Representatives The difference in average wait time is 2 minutes.

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 5: The student made a domain error in the graph.

Question 37

Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

$$15.7(1.98)^x = 11(99)^x$$

$x \approx 35$ customer service reps

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.

$B(100) = 4.0264$
 $A(100) = 2.0821$

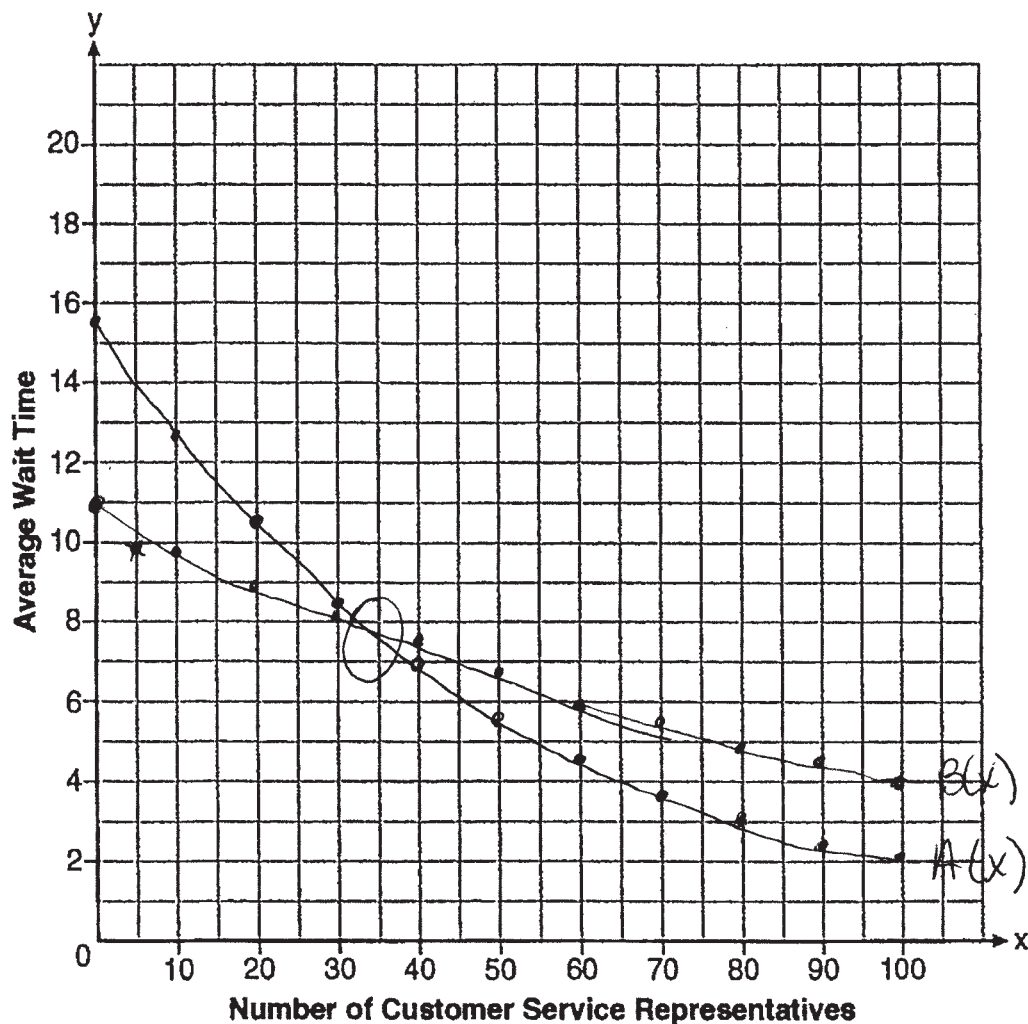
This value represents that with 100 customer service reps represented Plan B is 2 minutes slower than Plan A.

$4.0264 - 2.0821 = 1.9443 \approx 2$ min

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 5: The student gave an incomplete explanation.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

35

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

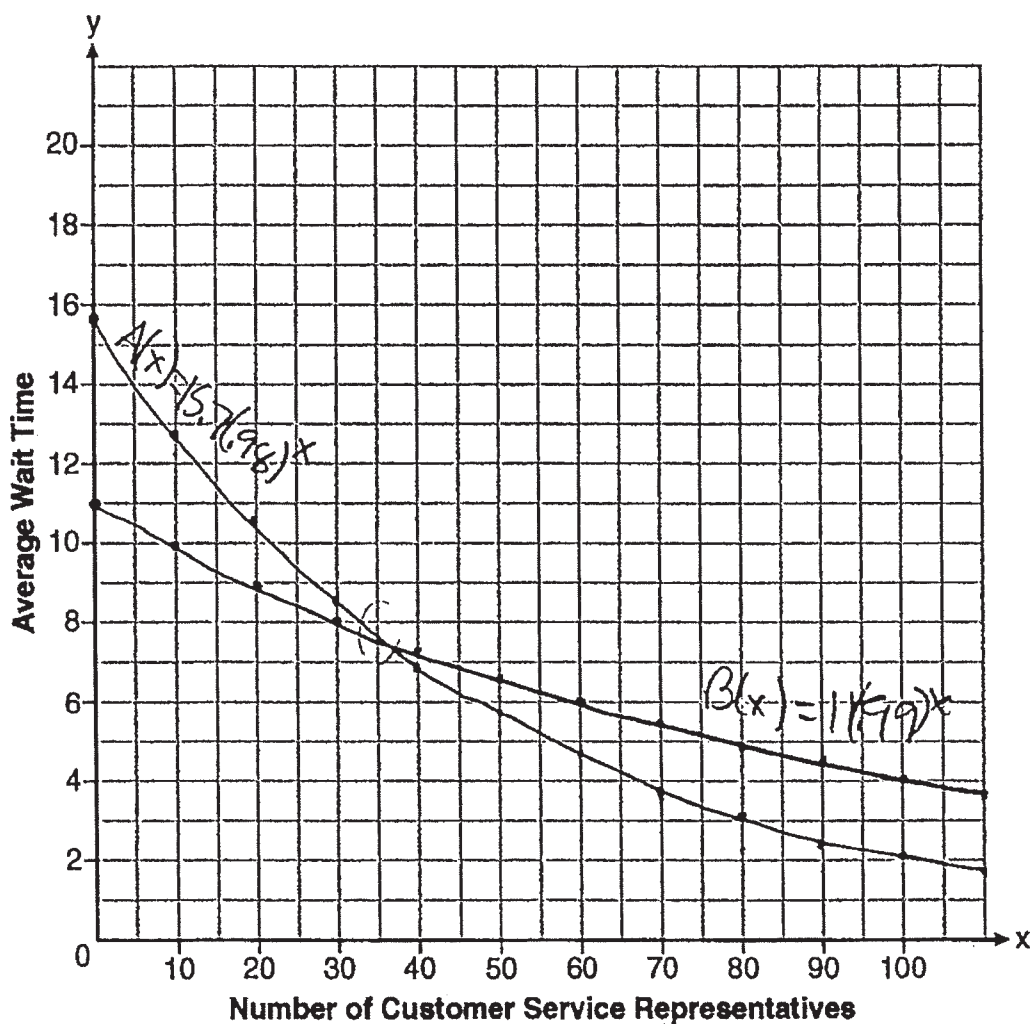
$$4.0264 - 2.0812 = 1.9$$

2 min is the
difference in
wait time.

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 4: The student made a domain error and wrote an incomplete explanation.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$x = 35$$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

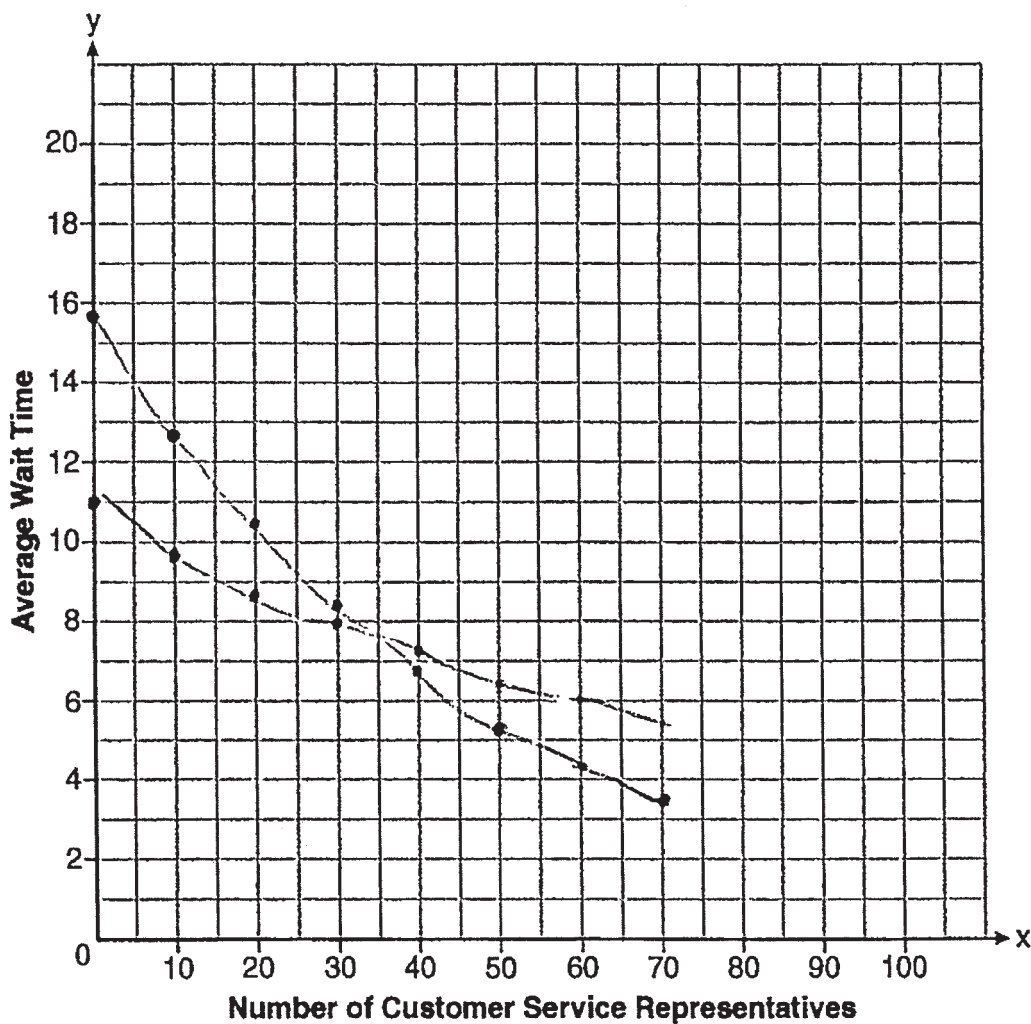
$$4 - 2 = 2$$

2 minutes of faster support time

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 3: The student made a domain error, wrote no labels and an incomplete explanation.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

7.7 minutes
35 customers

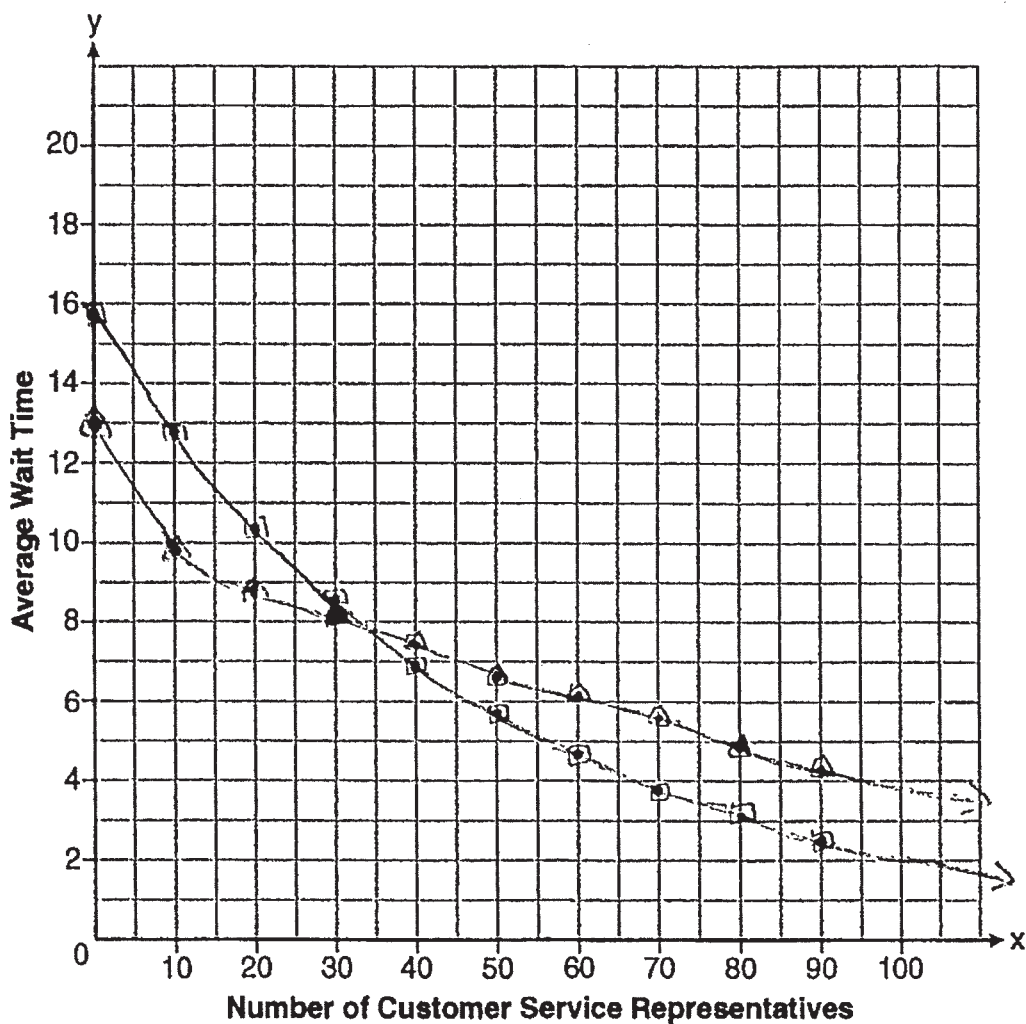
Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

the difference in time between
the line 4-8 (minutes)

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 2: The student only received credit for the second part.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$15.7(0.98)^x = 11(0.99)^x$$
$$\boxed{x=35}$$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

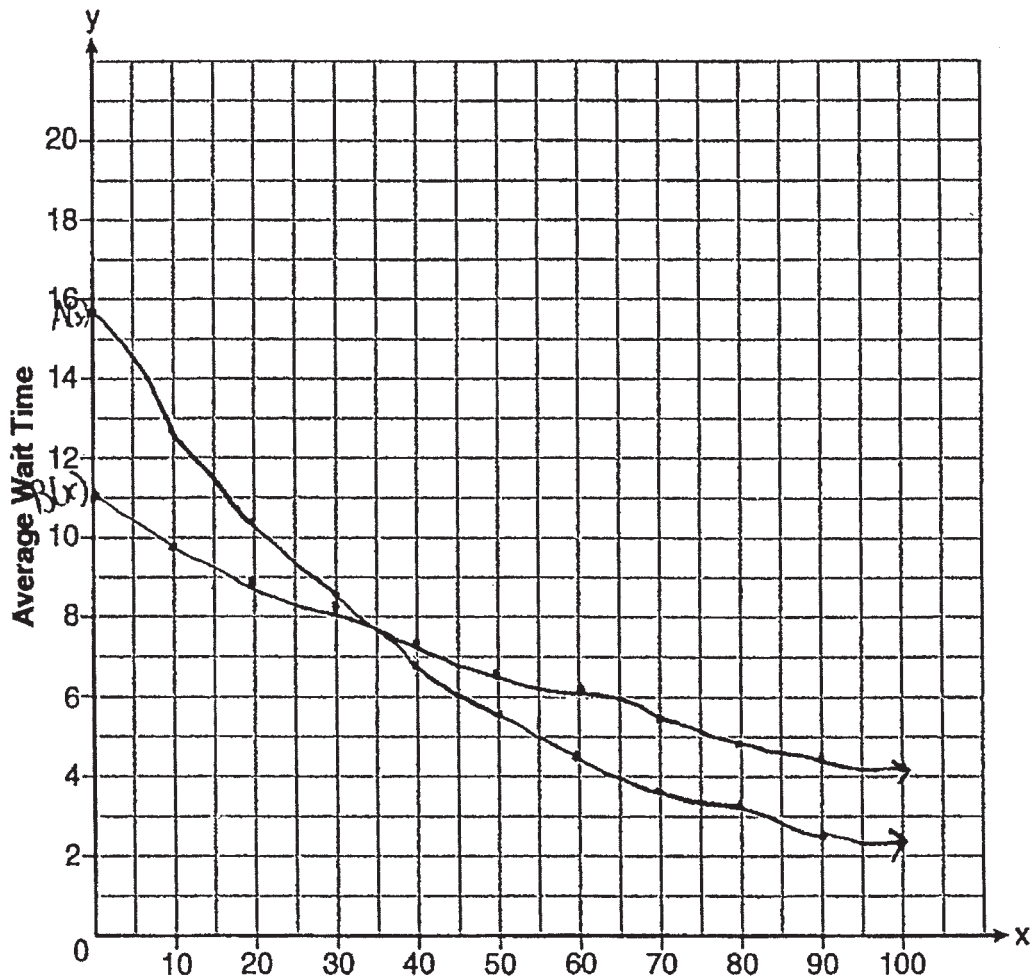
$$4.0264 - 2.0821 = 1.9443$$

This represents the difference

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan *A* can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan *B* can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 2: The student made a domain error, a rounding error, and did not complete the third part.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$\begin{aligned} 15.7(.98)^{36.042545} &= 116.49^{33.642545} & x &= 35.042545 \\ 15.7(.94265041955)^{36.042545} &= 116.7031466177 \\ 7.734612744 &= 7.734612744 \end{aligned}$$

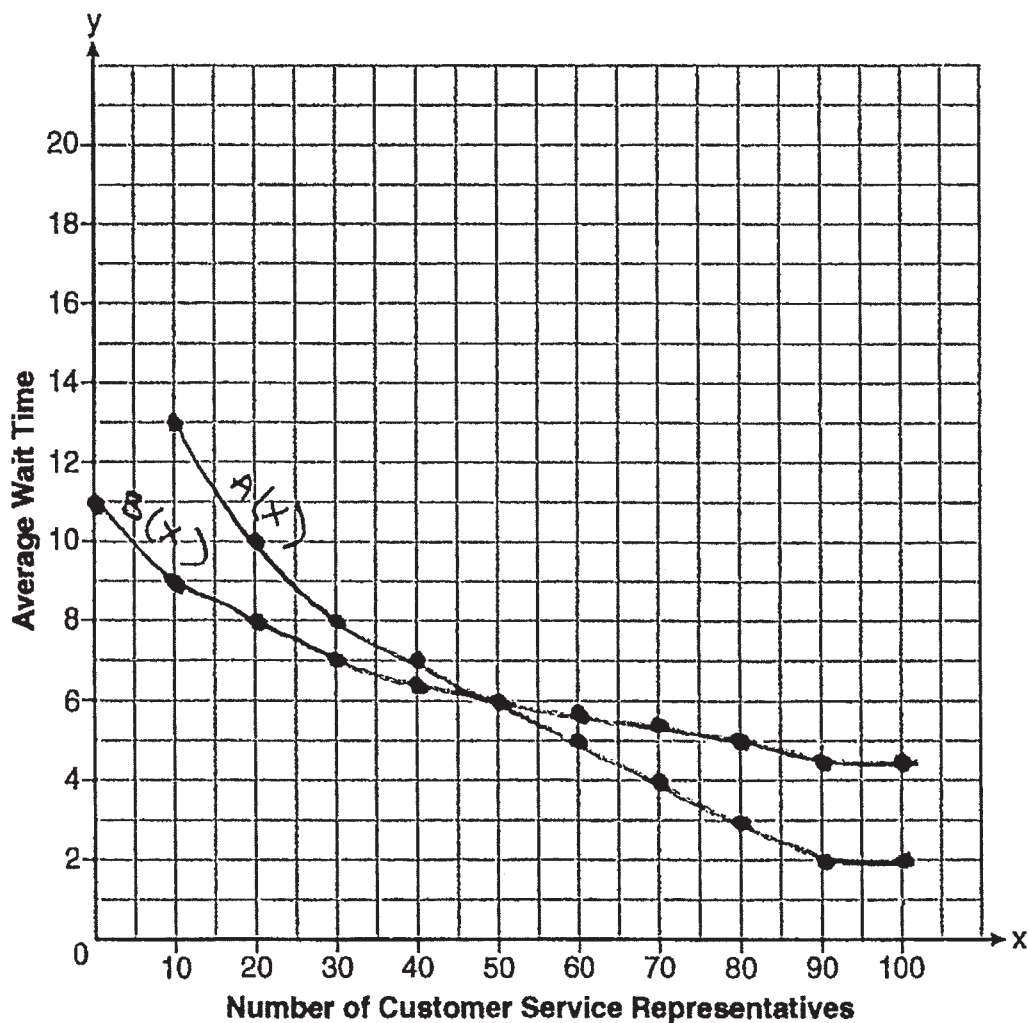
Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$$4.0264 - 2.0821 =$$

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 1: The student calculated $B(100) - A(100)$, but showed no further correct work.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$15.7(.98)^x = 11(.99)^y$$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$$B = 11(.99)^{100}$$
$$B = 4.026355754$$

$$A = 15.7(.98)^{100}$$
$$A = 2.082127028$$

wait average
time →

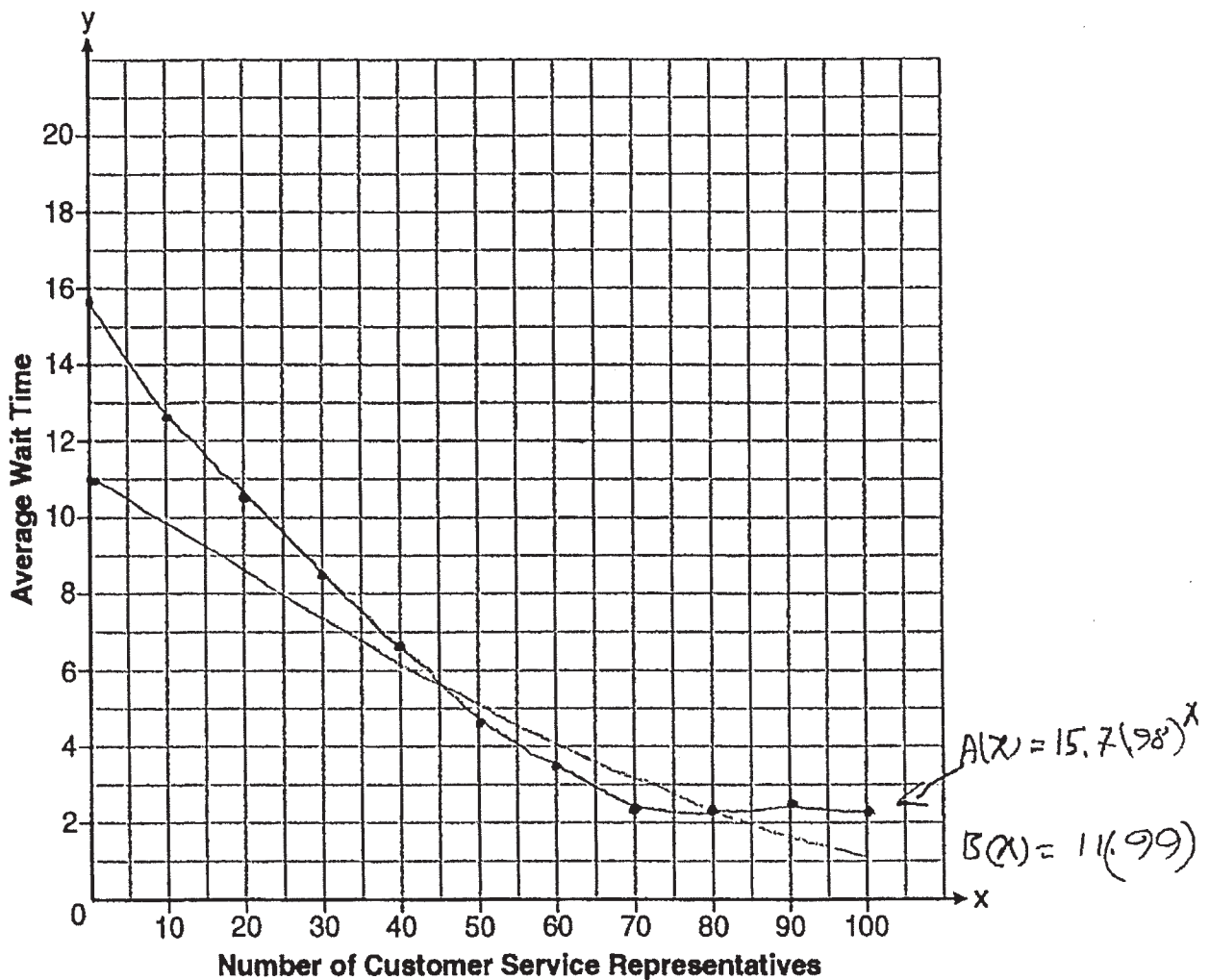
$$B(100) - A(100) =$$
$$1.944228726$$

2 minutes

Question 37

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.



Question 37 is continued on the next page.

Score 0: The student did not show enough correct work to receive any credit.

Question 37

Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$15.7(.98)^x = 11(.99)^x$$
$$15.7x \frac{100.98}{100.98} - 11x \frac{100.99}{100.98}$$

$$4.7x = .49747 \dots$$

$$x = .1052$$

$$x = 0$$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

Regents Examination in Algebra II – August 2022

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the August 2022 exam only.)

Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level
86	100	5	57	81	4	28	65	3
85	99	5	56	81	4	27	64	2
84	98	5	55	81	4	26	63	2
83	97	5	54	80	4	25	62	2
82	96	5	53	80	4	24	60	2
81	95	5	52	79	4	23	59	2
80	94	5	51	79	4	22	56	2
79	93	5	50	79	4	21	55	2
78	93	5	49	78	4	20	53	1
77	92	5	48	78	4	19	52	1
76	91	5	47	78	4	18	50	1
75	90	5	46	77	3	17	48	1
74	90	5	45	77	3	16	46	1
73	89	5	44	76	3	15	44	1
72	89	5	43	76	3	14	42	1
71	88	5	42	76	3	13	39	1
70	87	5	41	75	3	12	37	1
69	87	5	40	75	3	11	34	1
68	86	5	39	74	3	10	32	1
67	86	5	38	73	3	9	29	1
66	86	5	37	73	3	8	26	1
65	85	5	36	72	3	7	23	1
64	84	4	35	71	3	6	20	1
63	84	4	34	71	3	5	17	1
62	83	4	33	70	3	4	14	1
61	83	4	32	69	3	3	10	1
60	82	4	31	68	3	2	7	1
59	82	4	30	67	3	1	4	1
58	82	4	29	66	3	0	0	1

To determine the student’s final examination score (scale score), find the student’s total test raw score in the column labeled “Raw Score” and then locate the scale score that corresponds to that raw score. The scale score is the student’s final examination score. Enter this score in the space labeled “Scale Score” on the student’s answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student’s final score. The chart above is usable only for this administration of the Regents Examination in Algebra II.