

ALGEBRA II

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

ALGEBRA II

Tuesday, August 18, 2026 — 12:30 to 3:30 p.m., only

Student Name

Mr. Sibo

School Name

JMAP

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 36 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 expression $\frac{2}{3}\sqrt{-108}$ is equivalent to

(1) $-24\sqrt{3}$

(3) $4i\sqrt{3}$

(2) $-4\sqrt{3}$

(4) $24i\sqrt{3}$

$$\frac{2}{3} \sqrt{-36} \sqrt{3}$$
$$4i\sqrt{3}$$

2 Which statement is true about the graph of $y = \sqrt{9 - 2x}$?

(1) The x -intercept is $(4, 0)$.

(2) The y -intercept is $(0, 3)$.

(3) It is always increasing.

(4) The y -values are always negative.

3 An exponential function that contains the points $(0, 20)$ and $(1, 10)$ is

(1) $f(x) = 10(2)^x$

(3) $f(x) = 20(0.5)^x$

(2) $f(x) = 10(0.5)^x$

(4) $f(x) = 20(2)^x$

Use this space for
computations.

- 4 If A and B are two events such that $P(A \text{ and } B) = 0.2$, $P(A) = 0.3$, and $P(B) = 0.4$, what is $P(A \text{ or } B)$?

- (1) 0.9
(2) 0.7

(3) 0.5
(4) 0.1

$$.4 + .3 - .2 = .5$$

- 5 Which value of x is in the solution set of $f(x) < g(x)$
if $f(x) = \sqrt[3]{x}$ and $g(x) = x^3 - 4x$?

- (1) 1
(2) 2

(3) 0
(4) -1

$$f(-1) = -1$$

$$g(-1) = (-1)^3 - 4(-1) = -1 + 4 = 3$$

- 6 Consider the recursive formula below.

$$a_1 = 200$$
$$a_n = (0.8)a_{n-1}$$

The value of a_4 is

- (1) 202.4
(2) 159

(3) 102.4
(4) 81.92

$$a_1 = 200$$

$$a_2 = 160$$

$$a_3 = 128$$

$$a_4 = 102.4$$

Use this space for
computations.

- 7 Antonella is solving a system of equations. Part of her work is shown below.

$$(x - 4)^2 + (y + 1)^2 = 25$$

$$y = -x + 4$$

Step 1: $(x - 4)^2 + (-x + 4 + 1)^2 = 25$

Step 2: $(x - 4)^2 + (-x + 5)^2 = 25$

Step 3: $x^2 - 8x + 16 - x^2 - 10x + 25 = 25$

Which statement best describes Antonella's work?

- (1) In step 1, she substituted incorrectly.
- (2) In step 2, she added incorrectly.
- ☒ (3) In step 3, she multiplied incorrectly.
- (4) Her work is correct.

- 8 Given $a > 0$ and $b > 0$, the expression $\frac{\sqrt{a^6 b^5}}{\sqrt[3]{a^5 b^3}}$ is equivalent to

☒ (1) $a^{\frac{4}{3}} b^{\frac{3}{2}}$

(3) $(ab)^{\frac{17}{6}}$

(2) $a^{-\frac{4}{15}} b^{-\frac{3}{5}}$

(4) $a^{\frac{1}{3}} b^{\frac{2}{3}}$

$$\frac{a^{\frac{6}{2}} b^{\frac{5}{2}}}{a^{\frac{5}{3}} b^{\frac{3}{3}}} = a^{\frac{4}{3}} b^{\frac{3}{2}}$$

Use this space for
computations.

9 Which statement is true for the graph of $y = -x^3 - 2x^2 + 11x + 12$?

- (1) As $x \rightarrow \infty$, $y \rightarrow -\infty$.
- (2) -3 is a zero.
- (3) It always increases on the interval $(-1, 3)$.
- (4) $y > 0$ on the interval $(-4, -1)$.

10 The solution set to the equation $4x^{\frac{3}{2}} - 2 = 30$ is

- (1) $\{16\sqrt{2}\}$
- (2) $\{-4, 4\}$
- (3) $\left\{\frac{16}{3}\right\}$
- (4) $\{4\}$

$$4x^{\frac{3}{2}} = 32$$
$$\left(x^{\frac{3}{2}}\right)^{\frac{2}{3}} = 8^{\frac{2}{3}}$$
$$x = 4$$

11 The value of $2\tan\left(\frac{5\pi}{3}\right)$ is

- (1) $\frac{-2}{\sqrt{3}}$
- (2) $\frac{2}{\sqrt{3}}$
- (3) $-2\sqrt{3}$
- (4) $2\sqrt{3}$

Use this space for
computations.

- 12 Mark purchased a new car for \$26,700. His new car depreciates 12% per year. Which equation models the value, $V(t)$, of Mark's car t years after he purchased it?

(1) $V(t) = 26,700(1.12)^{t-1}$ (3) $V(t) = 26,700(0.88)^{t-1}$
 (2) $V(t) = 26,700(1.12)^t$ (4) $V(t) = 26,700(0.88)^t$

- 13 The table below shows the results of a survey of students regarding their favorite subject and whether or not they have pets at home.

	Math	Science	English	Social Studies	Total
Have Pets at Home	27	35	14	30	106
Do Not Have Pets at Home	52	49	28	15	144
Total	79	84	42	45	250

What is the probability, rounded to the *nearest thousandth*, that a randomly chosen student from this group prefers math and does not have pets at home?

- (1) 0.208 (3) 0.658
 (2) 0.316 (4) 0.892

$$\frac{52}{250} = .208$$

Use this space for
computations.

14 For the polynomial $p(x)$, it is determined that $p(5) = 0$. Which conclusion about $p(x)$ must be true?

- (1) $x - 5$ is a factor of $p(x)$.
- (2) $x + 5$ is a factor of $p(x)$.
- (3) When $p(x)$ is divided by 5 the remainder is 0.
- (4) $x = -5$ is a zero of $p(x)$.

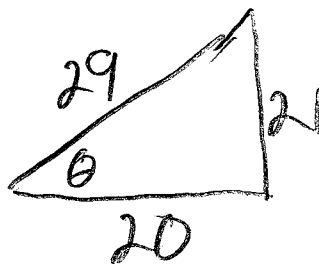
15 Given $\sin(\theta) = \frac{21}{29}$ and θ is an angle in standard position that terminates in Quadrant II, what is the value of $\tan(\theta)$?

(1) $\frac{21}{20}$

(3) $-\frac{20}{29}$

(2) $-\frac{21}{20}$

(4) $\frac{29}{21}$



16 The solution set to the equation $\frac{6}{k} + \frac{k+2}{k+3} = \frac{2}{k^2+3k}$ is

(1) $\{-3, 0\}$

(3) $\{-4, 4\}$

(2) $\{-4\}$

(4) $\{4\}$

$$\frac{6(k+3)}{k(k+3)} + \frac{k(k+2)}{k(k+3)} = \frac{2}{k^2+3k}$$

$$(k+4)^2 = 0$$

$$k = -4$$

$$6k+18 + k^2+2k = 2$$

$$k^2+8k+16=0$$

**Use this space for
computations.**

- 17 The weights of 500 ketchup packets used by a restaurant chain are approximately normally distributed with a mean of 0.95 ounces and a standard deviation of 0.04 ounces. What is the approximate number of packets that weigh between 0.91 and 0.99 ounces?

(1) 68

(3) 341

(2) 79

(4) 475

68 · 500

- 18 A school counselor wants to estimate the proportion of the 503 juniors at her school who plan to attend a SUNY school. The counselor surveys 50 randomly chosen juniors at her school to ask about their post-graduation plans and finds that 38% of them plan to attend a SUNY school. What is the parameter of interest?

(1) the mean number of juniors who plan to attend a SUNY school

(2) the 38 students who responded yes to the survey

(3) the proportion of students who are not planning to attend a SUNY school

(4) the proportion of all juniors from this high school who plan to attend a SUNY school

Use this space for
computations.

- 19 The sport of pickleball has grown by 59% over the three years from 2020 to 2023. The equation $P(t) = 5.6(1.59)^{\frac{t}{3}}$ can be used to model the number of people in a city playing pickleball, where $P(t)$ is measured in millions of people and t is measured in years since 2020. In terms of the yearly growth rate, the number of pickleball players could best be approximated by

- (1) $P(t) = 5.6(1.167)^t$ (3) $P(t) = 5.6(4.019)^t$
(2) $P(t) = 5.6(1.167)^{3t}$ (4) $P(t) = 5.6(4.019)^{3t}$

$$1.59^{\frac{1}{3}} \approx 1.167$$

- 20 The solutions to $\frac{x^2 + 7}{2} = -x$ are

- (1) $-1 \pm i\sqrt{6}$ (3) $-1 \pm 2i\sqrt{6}$
(2) $-2 \pm i\sqrt{6}$ (4) $-1 \pm i\sqrt{3}$

$$\begin{aligned} x^2 + 7 &= -2x \\ x^2 + 2x + 1 &= -7 + 1 \\ (x+1)^2 &= -6 \\ x+1 &= \pm\sqrt{-6} \\ x &= -1 \pm i\sqrt{6} \end{aligned}$$

- 21 The completely factored form of the expression $x^6 - 63x^3 - 64$ is

- (1) $(x - 64)(x + 1)$
(2) $(x^3 - 64)(x^3 + 1)$
(3) $(x + 8)(x - 8)(x + 1)(x - 1)$
(4) $(x - 4)(x^2 + 4x + 16)(x + 1)(x^2 - x + 1)$

$$\begin{aligned} u &= x^3 \\ u^2 - 63u - 64 & \\ (u - 64)(u + 1) & \\ (x^3 - 64)(x^3 + 1) & \end{aligned}$$

Use this space for
computations.

22 Which function is odd?

(1) $y = \sin(2x)$

(3) $y = \cos(-x)$

(2) $y = \sin(x) + 2$

(4) $y = \cos(x)$

23 What is the inverse of $f(x) = 2^x + 1$?

(1) $f^{-1}(x) = \log_2(x - 1)$

(3) $f^{-1}(x) = -2^x + 1$

(2) $f^{-1}(x) = \log_2(x) - 1$

(4) $f^{-1}(x) = -2^{-x} + 1$

$$x = 2^{y+1}$$

$$\log_2 x = \log_2 2^{y+1}$$

$$\log_2 x = y + 1$$

24 Given $a > 0$ and $b > 0$, which function's graph has a period of $4b$ and a maximum of $2a$?

(1) $y = \frac{3a}{2} \cos(4bx) + \frac{a}{2}$

(3) $y = a \cos(4bx) + a$

(2) $y = -\frac{3a}{2} \cos\left(\frac{\pi}{2b}x\right) + \frac{a}{2}$

(4) $y = \cos\left(\frac{\pi}{2b}x\right) + 2a$

$$\text{per} = \frac{2\pi}{b}$$

$$b = \frac{2\pi}{\text{per}} = \frac{2\pi}{4b}$$

$$-\frac{3a}{2}(-1) + \frac{a}{2}$$

$$\frac{3a}{2} + \frac{a}{2}$$

$$2a$$

$$b = \frac{\pi}{2b}$$

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 In order to keep the store properly stocked with produce, a grocery store manager wants to determine the most popular day of the week for people to buy apples and oranges. She randomly collects a sample of sales records for each day for three consecutive weeks. Is this type of data collection method a survey, an observational study, or an experiment? Explain your reasoning.

Observational study because the manager is not giving a treatment

- 26** Given the following functions $f(x) = 2x^2 + 3x - 7$ and $g(x) = 2x - 5$, determine $f(x) - g(x)$, and express the result in standard form.

$$2x^2 + 3x - 7 - (2x - 5)$$

$$2x^2 + x - 2$$

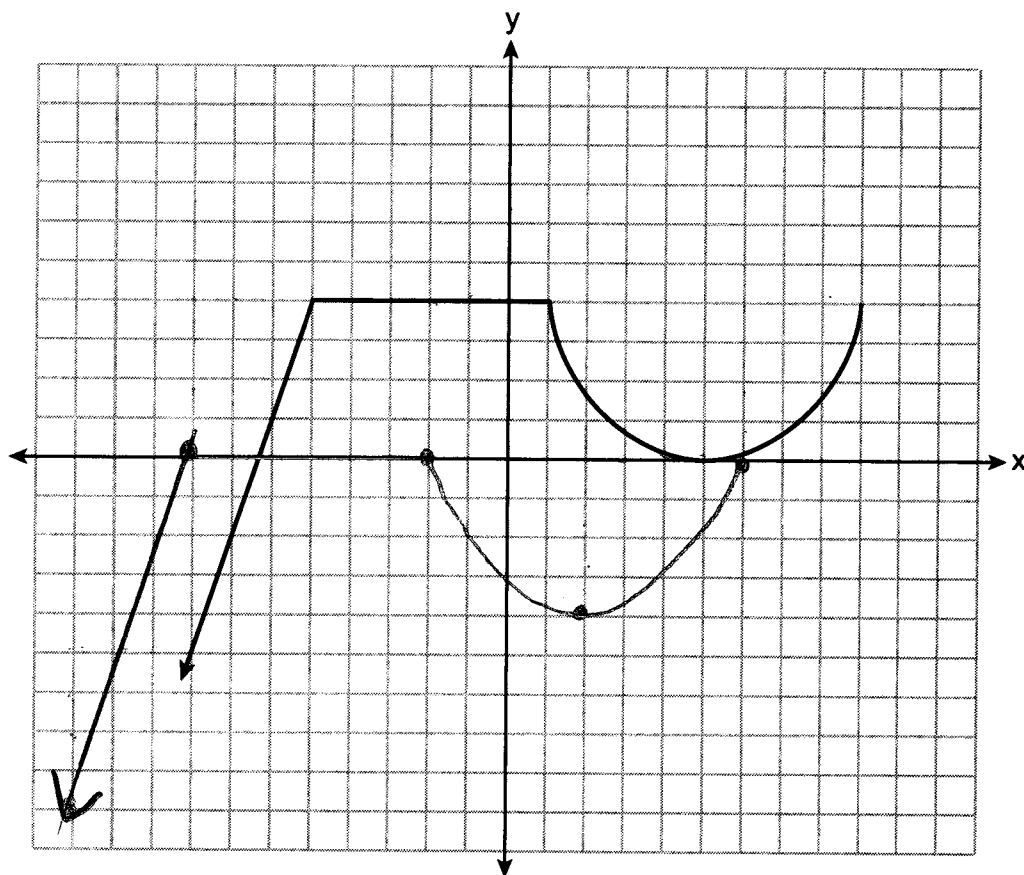
27 Determine algebraically the zeros of $f(x) = x^3 - 4x^2 - 9x + 36$.

$$x^2(x-4) - 9(x-4)$$

$$(x^2 - 9)(x - 4)$$

$$= (x-3)(x+3)(x-4)$$

28 The graph of $y = f(x)$ is shown below. On the same set of axes, graph $y = f(x + 3) - 4$.



29 Express $(-2 + \sqrt{-25})^2$ in simplest $a + bi$ form. Justify your answer.

$$(-2 + 5i)(-2 + 5i)$$

$$4 - 10i - 10i + 25i^2$$

$$4 - 20i - 25$$

$$-21 - 20i$$

- 30** The most common radioactive form of cesium is cesium-137. The half-life of cesium-137 is 30 years.

Suppose 2.7 micrograms of cesium-137 are found in a soil sample. Write a function for the amount of cesium-137 remaining, $c(t)$, in micrograms, in terms of the number of years, t , since the soil sample was taken.

$$c(t) = 2.7 \left(\frac{1}{2}\right)^{\frac{t}{30}}$$

31 Solve algebraically for x:

$$\sum_{a=0}^4 (ax - 3) = 5$$

$$0 - 3$$

$$x - 3$$

$$2x - 3$$

$$3x - 3$$

$$4x - 3$$

$$10x - 15 = 5$$

$$10x = 20$$

$$x = 2$$

- 32 Given the exponential function $y = 5.381e^{0.214x}$, rewrite the function in the form of $y = a(b)^x$, rounding values to the *nearest thousandth*.

$$y = 5.381(1.239)^x$$

Part III

Answer all 3 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. [12]

33 Determine the quotient and remainder of the expression below.

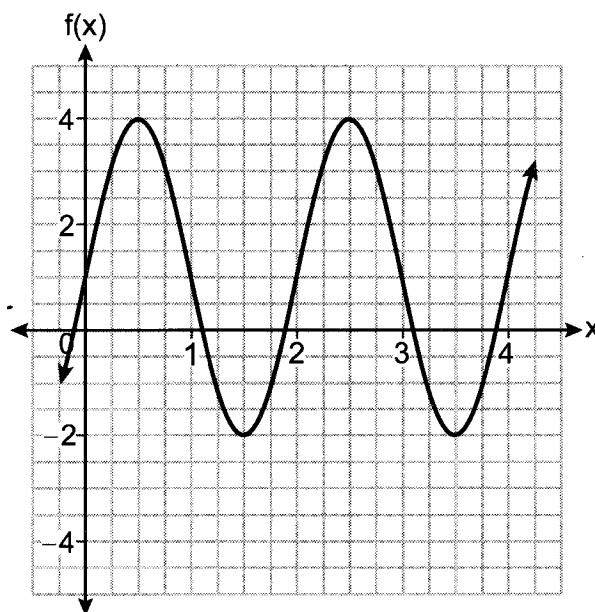
$$\frac{2x^4 - 27x^2 + 33x - 8}{x^2 + 3x - 5}$$

Express the result in the form $q(x) + \frac{r(x)}{d(x)}$.

$$\begin{array}{r}
 2x^2 - 6x + 1 \\
 \hline
 x^2 + 3x - 5 \overline{) 2x^4 + 0x^3 - 27x^2 + 33x - 8} \\
 \underline{2x^4 + 6x^3 - 10x^2} \\
 -6x^3 - 17x^2 + 33x \\
 \underline{-6x^3 - 18x^2 + 30x} \\
 x^2 + 3x - 8 \\
 \underline{x^2 + 3x - 5} \\
 -3
 \end{array}$$

$$2x^2 - 6x + 1 + \frac{-3}{x^2 + 3x - 5}$$

34 The sinusoidal function f is graphed below.



State the period of the function f .

2

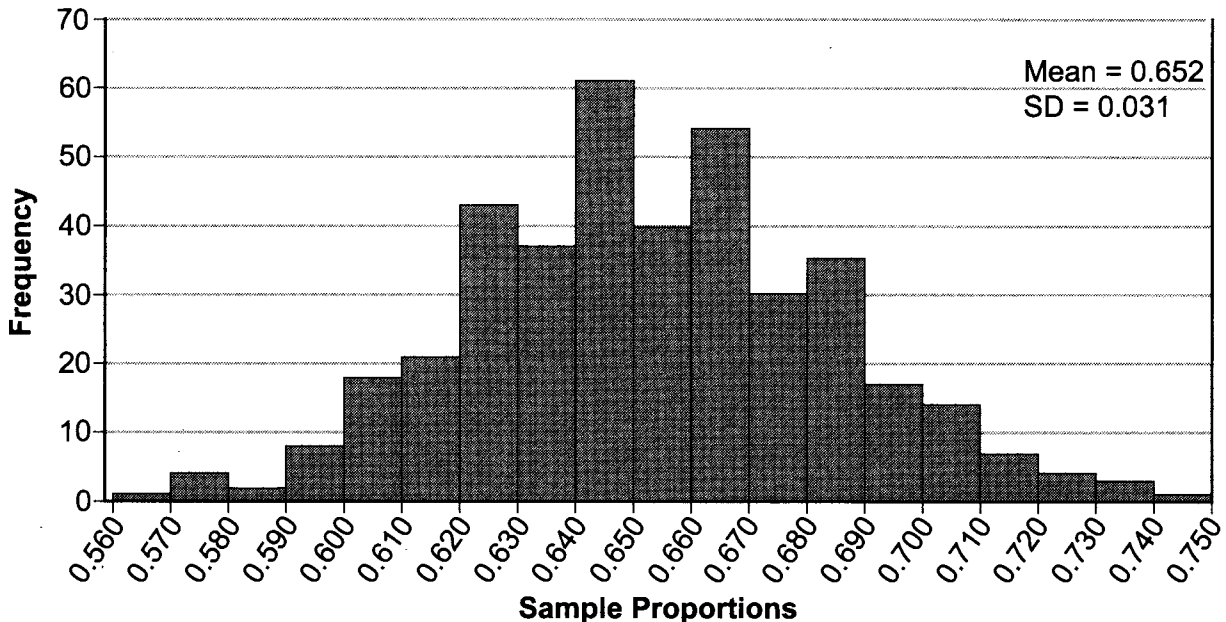
State the amplitude of the function f .

$$\frac{4 - (-2)}{2} = \frac{6}{2} = 3$$

Write the equation in the form $f(x) = A \sin(Bx) + D$ to represent the sinusoidal function.

$$f(x) = 3 \sin \pi x + 1$$

- 35 A principal wonders what percentage of parents at her large high school restrict their child's cell phone privileges. The school surveys a random sample of 250 parents at the school and finds that 65% of them restrict their child's cell phone privileges. The school runs a simulation with 400 samples of 250 parents, assuming that 65% of them restrict cell phone privileges. The simulation results are shown below.



Use the simulation to determine an interval containing the middle 95% of simulated proportions. Justify your answer. Round all values to the *nearest hundredth*.

.59 - .71

The school district's superintendent worries that less than half of parents restrict their child's cell phone privileges. Do the simulation results support the superintendent's concern? Explain.

No, because half falls out of the confidence interval

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]

- 36 Lubin pours green tea into a cup to cool. The function below can be used to model the temperature, in degrees Fahrenheit, of Lubin's tea x minutes after he pours it into the cup.

$$T(x) = 110e^{-0.0453x} + 74$$

State the temperature of the tea, in degrees Fahrenheit, when Lubin poured it into the cup.

$$110 + 74 = 184$$

To the *nearest tenth*, use $T(x)$ to determine the average rate of change in degrees per minute, from $x = 0$ to $x = 5$.

$$\frac{T(5) - T(0)}{5 - 0} \approx -4.5$$

Question 36 is continued on the next page.

Question 36 continued

Interpret the value of the average rate of change within the given context.

From $t=0$ to $t=5$, the temperature of the tea decreases about 4.5° every minute

To the *nearest tenth of a minute*, determine how long Lubin must wait after pouring his tea into the cup before the tea's temperature reaches 120° Fahrenheit.

$$120 = 110 e^{-0.0453x} + 74$$

$$x \approx 19.2$$