

ALGEBRA I (COMMON CORE)

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

ALGEBRA I (Common Core)

Wednesday, August 13, 2014 — 8:30 to 11:30 a.m., only

Student Name: Mr. Sibal

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 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. 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.

ALGEBRA I (COMMON CORE)

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. 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 Which statement is *not* always true?

- (1) The product of two irrational numbers is irrational.
- (2) The product of two rational numbers is rational.
- (3) The sum of two rational numbers is rational.
- (4) The sum of a rational number and an irrational number is irrational.

2 A satellite television company charges a one-time installation fee and a monthly service charge. The total cost is modeled by the function $y = 40 + 90x$. Which statement represents the meaning of each part of the function?

- (1) y is the total cost, x is the number of months of service, \$90 is the installation fee, and \$40 is the service charge per month.
- (2) y is the total cost, x is the number of months of service, \$40 is the installation fee, and \$90 is the service charge per month.
- (3) x is the total cost, y is the number of months of service, \$40 is the installation fee, and \$90 is the service charge per month.
- (4) x is the total cost, y is the number of months of service, \$90 is the installation fee, and \$40 is the service charge per month.

3 If $4x^2 - 100 = 0$, the roots of the equation are

- (1) -25 and 25
- (2) -25, only
- (3) -5 and 5
- (4) -5, only

$$\begin{aligned} 4(x^2 - 25) &= 0 \\ x^2 - 25 &= 0 \\ x &= \pm 5 \end{aligned}$$

Use this space for computations.

4 Isaiah collects data from two different companies, each with four employees. The results of the study, based on each worker's age and salary, are listed in the tables below.

Company 1	
Worker's Age in Years	Salary in Dollars
25	30,000
27	32,000
28	35,000
33	38,000

Company 2	
Worker's Age in Years	Salary in Dollars
25	29,000
28	35,500
29	37,000
31	65,000

Which statement is true about these data?

- (1) The median salaries in both companies are greater than \$37,000.
- (2) The mean salary in company 1 is greater than the mean salary in company 2.
- (3) The salary range in company 2 is greater than the salary range in company 1.
- (4) The mean age of workers at company 1 is greater than the mean age of workers at company 2.

1	2
33,500	36,250
33,750	44,125
8,000	36,000
28.25	28.25

5 Which point is *not* on the graph represented by $y = x^2 + 3x - 6$?

- (1) (-6,12)
- (2) (-4,-2)
- (3) (2,4)
- (4) (3,-6)

$\rightarrow 3^2 + 3(3) - 6$
 $= 12$

Use this space for computations.

6 A company produces x units of a product per month, where $C(x)$ represents the total cost and $R(x)$ represents the total revenue for the month. The functions are modeled by $C(x) = 300x + 250$ and $R(x) = -0.5x^2 + 800x - 100$. The profit is the difference between revenue and cost where $P(x) = R(x) - C(x)$. What is the total profit, $P(x)$, for the month?

(1) $P(x) = -0.5x^2 + 500x - 150$

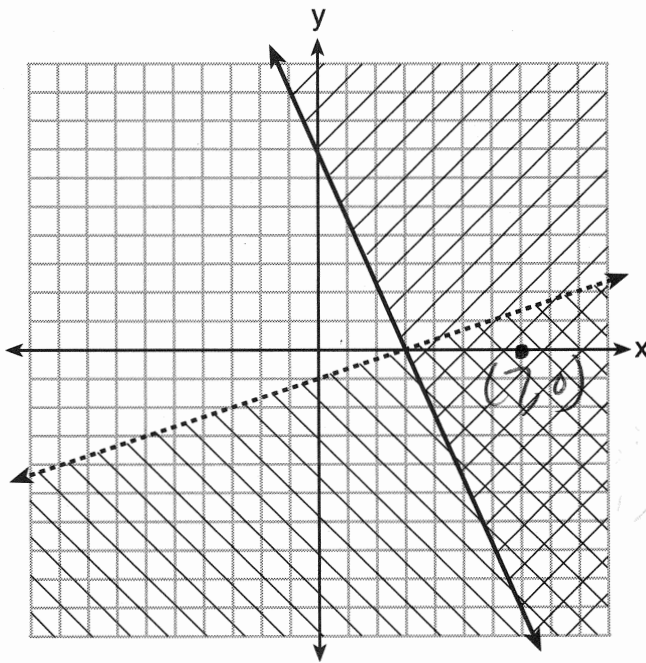
(2) $P(x) = -0.5x^2 + 500x - 350$

(3) $P(x) = -0.5x^2 - 500x + 350$

(4) $P(x) = -0.5x^2 + 500x + 350$

$$\begin{aligned} & -0.5x^2 + 800x - 100 - (300x + 250) \\ & -0.5x^2 + 500x - 350 \end{aligned}$$

7 What is one point that lies in the solution set of the system of inequalities graphed below?



(1) (7,0)

(3) (0,7)

(2) (3,0)

(4) (-3,5)

Use this space for computations.

8 The value of the x -intercept for the graph of $4x - 5y = 40$ is

(1) 10

(2) $\frac{4}{5}$

(3) $-\frac{4}{5}$

(4) -8

$4x - 5(0) = 40$
 $4x = 40$
 $x = 10$

9 Sam and Jeremy have ages that are consecutive odd integers. The product of their ages is 783. Which equation could be used to find Jeremy's age, j , if he is the younger man?

(1) $j^2 + 2 = 783$

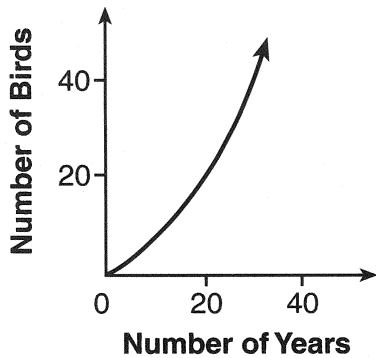
(2) $j^2 - 2 = 783$

(3) $j^2 + 2j = 783$

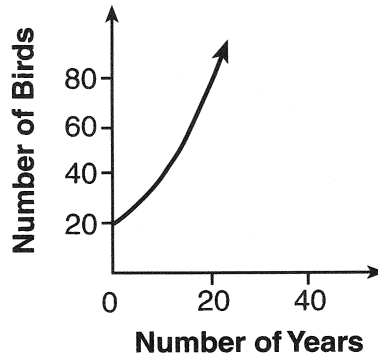
(4) $j^2 - 2j = 783$

$j(j+2) = 783$
 $j^2 + 2j = 783$

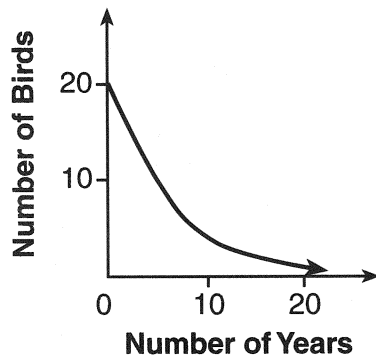
10 A population that initially has 20 birds approximately doubles every 10 years. Which graph represents this population growth?



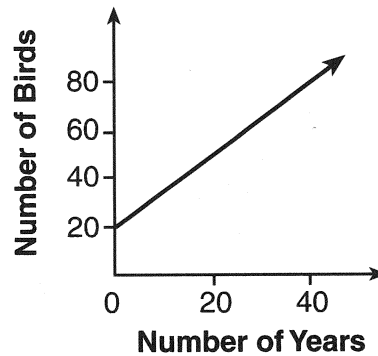
(1)



(3)



(2)



(4)

11 Let f be a function such that $f(x) = 2x - 4$ is defined on the domain $2 \leq x \leq 6$. The range of this function is

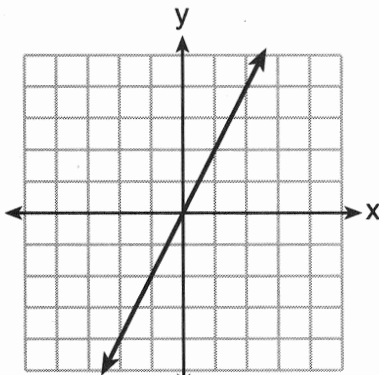
- (1) $0 \leq y \leq 8$ (3) $2 \leq y \leq 6$
 (2) $0 \leq y < \infty$ (4) $-\infty < y < \infty$

$2(2) - 4 = 4 - 4 = 0$
 $2(6) - 4 = 12 - 4 = 8$

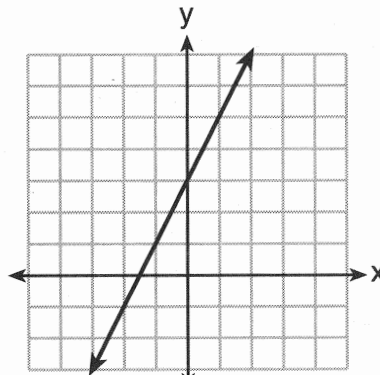
12 Which situation could be modeled by using a linear function?

- (1) a bank account balance that grows at a rate of 5% per year, compounded annually
 (2) a population of bacteria that doubles every 4.5 hours
 (3) the cost of cell phone service that charges a base amount plus 20 cents per minute
 (4) the concentration of medicine in a person's body that decays by a factor of one-third every hour

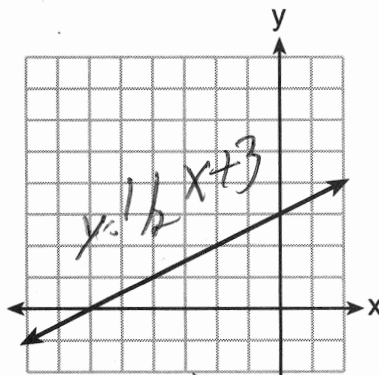
13 Which graph shows a line where each value of y is three more than half of x ?



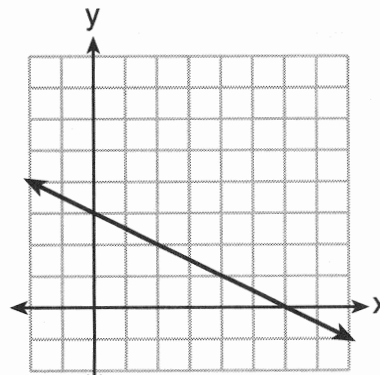
(1)



(3)



(2)



(4)

Use this space for computations.

14 The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

Age (years)	Average Pupil Diameter (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?

- (1) 2.4
 (2) 0.04
 (3) -2.4
 (4) -0.04

$$\frac{4.7 - 2.3}{20 - 80} = \frac{2.4}{-60} = -0.04$$

15 Which expression is equivalent to $x^4 - 12x^2 + 36$?

- (1) $(x^2 - 6)(x^2 - 6)$
 (2) $(x^2 + 6)(x^2 + 6)$
 (3) $(6 - x^2)(6 + x^2)$
 (4) $(x^2 + 6)(x^2 - 6)$

16 The third term in an arithmetic sequence is 10 and the fifth term is 26. If the first term is a_1 , which is an equation for the n th term of this sequence?

- (1) $a_n = 8n + 10$
 (2) $a_n = 8n - 14$
 (3) $a_n = 16n + 10$
 (4) $a_n = 16n - 38$

$$2d = 16$$

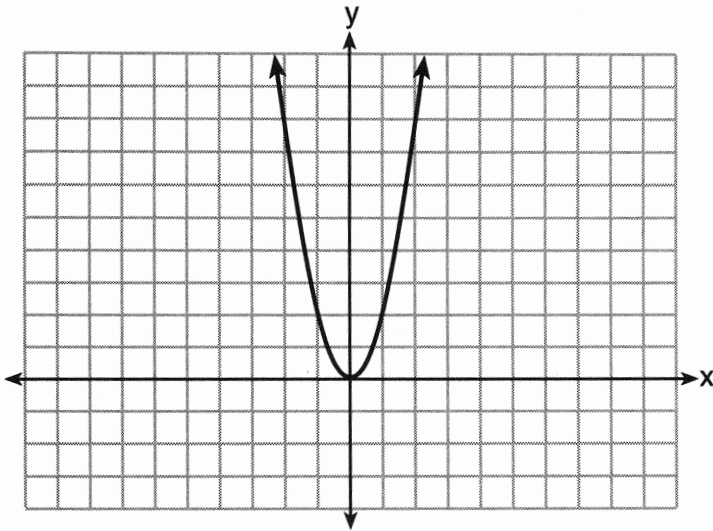
$$d = 8$$

$$10 = 8(3) + x$$

$$-14 = x$$

17 The graph of the equation $y = ax^2$ is shown below.

Use this space for
computations.



If a is multiplied by $-\frac{1}{2}$, the graph of the new equation is

- (1) wider and opens downward
- (2) wider and opens upward
- (3) narrower and opens downward
- (4) narrower and opens upward

18 The zeros of the function $f(x) = (x + 2)^2 - 25$ are

- (1) -2 and 5
- (2) -3 and 7
- (3) -5 and 2
- (4) -7 and 3

$$(x+2)^2 - 25 = 0$$
$$x+2+5=0 \quad x+2-5=0$$
$$x=-7 \quad x=3$$

Use this space for computations.

19 During the 2010 season, football player McGee's earnings, m , were 0.005 million dollars more than those of his teammate Fitzpatrick's earnings, f . The two players earned a total of 3.95 million dollars. Which system of equations could be used to determine the amount each player earned, in millions of dollars?

- (1) $m + f = 3.95$
 $m + 0.005 = f$
- (2) $m - 3.95 = f$
 $f + 0.005 = m$
- (3) $f - 3.95 = m$
 $m + 0.005 = f$
- (4) $m + f = 3.95$
 $f + 0.005 = m$

20 What is the value of x in the equation $\frac{x-2}{3} + \frac{1}{6} = \frac{5}{6}$?

- (1) 4
- (2) 6
- (3) 8
- (4) 11

$$\frac{x-2}{3} = \frac{4}{6}$$
$$6x - 12 = 12$$
$$6x = 24$$
$$x = 4$$

21 The table below shows the number of grams of carbohydrates, x , and the number of Calories, y , of six different foods.

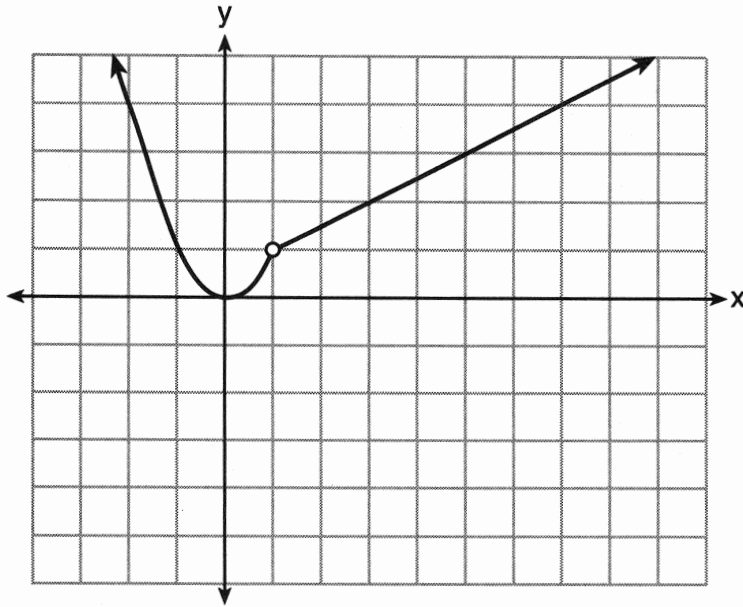
Carbohydrates (x)	Calories (y)
8	120
9.5	138
10	147
6	88
7	108
4	62

Which equation best represents the line of best fit for this set of data?

- (1) $y = 15x$
- (2) $y = 0.07x$
- (3) $y = 0.1x - 0.4$
- (4) $y = 14.1x + 5.8$

22 A function is graphed on the set of axes below.

Use this space for computations.



Which function is related to the graph?

(1) $f(x) = \begin{cases} x^2, & x < 1 \\ x - 2, & x > 1 \end{cases}$ (3) $f(x) = \begin{cases} x^2, & x < 1 \\ 2x - 7, & x > 1 \end{cases}$

(2) $f(x) = \begin{cases} x^2, & x < 1 \\ \frac{1}{2}x + \frac{1}{2}, & x > 1 \end{cases}$ (4) $f(x) = \begin{cases} x^2, & x < 1 \\ \frac{3}{2}x - \frac{9}{2}, & x > 1 \end{cases}$

23 The function $h(t) = -16t^2 + 144$ represents the height, $h(t)$, in feet, of an object from the ground at t seconds after it is dropped. A realistic domain for this function is

- (1) $-3 \leq t \leq 3$ (3) $0 \leq h(t) \leq 144$
 (2) $0 \leq t \leq 3$ (4) all real numbers

24 If $f(1) = 3$ and $f(n) = -2f(n - 1) + 1$, then $f(5) =$

- (1) -5 (3) 21
 (2) 11 (4) 43

$f(1) = 3$
 $f(2) = -5$
 $f(3) = 11$
 $f(4) = -21$
 $f(5) = 43$

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. 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 the equation $x^2 + 10x + 24 = (x + a)(x + b)$, b is an integer. Find algebraically *all* possible values of b .

$$\begin{aligned} &= (x+6)(x+4) \\ &= (x+4)(x+6) \end{aligned}$$

6 & 4

26 Rhonda deposited \$3000 in an account in the Merrick National Bank, earning 4.2% interest, compounded annually. She made no deposits or withdrawals. Write an equation that can be used to find B , her account balance after t years.

$$B = 3000(1.042)^t$$

27 Guy and Jim work at a furniture store. Guy is paid \$185 per week plus 3% of his total sales in dollars, x , which can be represented by $g(x) = 185 + 0.03x$. Jim is paid \$275 per week plus 2.5% of his total sales in dollars, x , which can be represented by $f(x) = 275 + 0.025x$. Determine the value of x , in dollars, that will make their weekly pay the same.

$$185 + .03x = 275 + .025x$$

$$.005x = 90$$

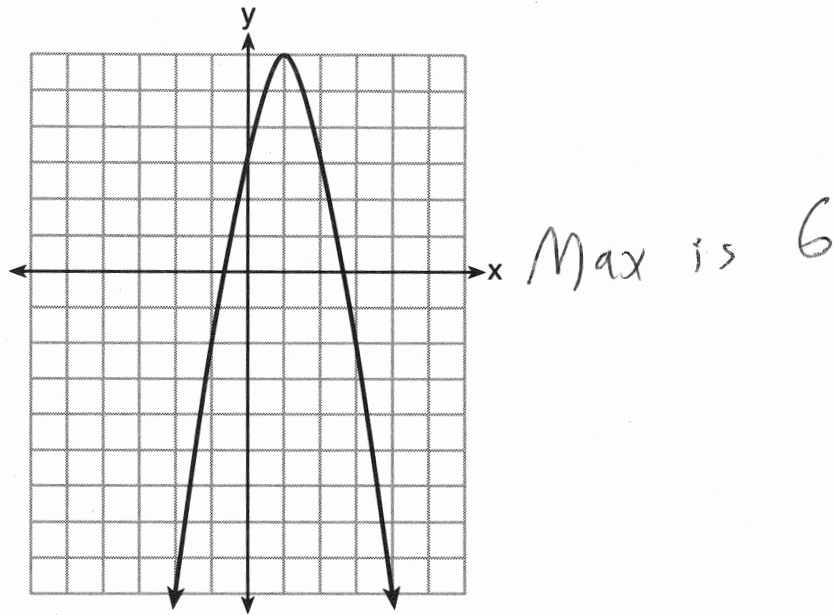
$$x = 18,000$$

28 Express the product of $2x^2 + 7x - 10$ and $x + 5$ in standard form.

$$2x^3 + 7x^2 - 10x + 10x^2 + 35x - 50$$

$$2x^3 + 17x^2 + 25x - 50$$

29 Let f be the function represented by the graph below.



Let g be a function such that $g(x) = -\frac{1}{2}x^2 + 4x + 3$.

Determine which function has the larger maximum value. Justify your answer.

$$\begin{aligned}x &= \frac{-b}{2a} = \frac{-4}{2(-\frac{1}{2})} = \frac{-4}{-1} = 4 \\y &= -\frac{1}{2}(4)^2 + 4(4) + 3 \\&= -8 + 16 + 3 \\&= 11 \text{ is the Max} \\g(x) &\text{ has the larger} \\&\text{Maximum}\end{aligned}$$

30 Solve the inequality below to determine and state the smallest possible value for x in the solution set.

$$3(x + 3) \leq 5x - 3$$

$$3x + 9 \leq 5x - 3$$

$$\frac{12 \leq 2x}{2} \quad \frac{2x}{2}$$

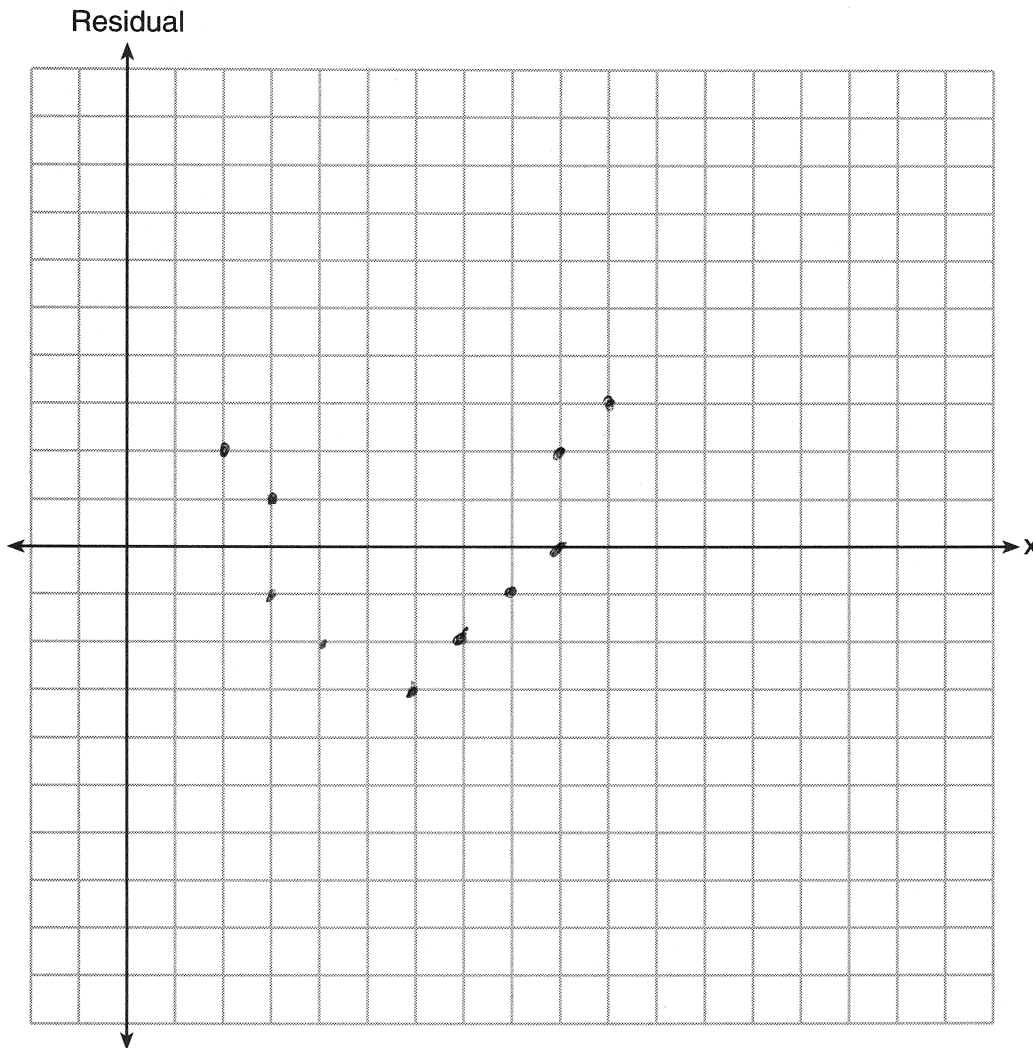
$$6 \leq x$$

6 is smallest possible value

31 The table below represents the residuals for a line of best fit.

x	2	3	3	4	6	7	8	9	9	10
Residual	2	1	-1	-2	-3	-2	-1	2	0	3

Plot these residuals on the set of axes below.



Using the plot, assess the fit of the line for these residuals and justify your answer.

The line is a poor fit because the residuals form a pattern.

32 A student was given the equation $x^2 + 6x - 13 = 0$ to solve by completing the square. The first step that was written is shown below.

$$x^2 + 6x = 13$$

The next step in the student's process was $x^2 + 6x + c = 13 + c$.

State the value of c that creates a perfect square trinomial.

9

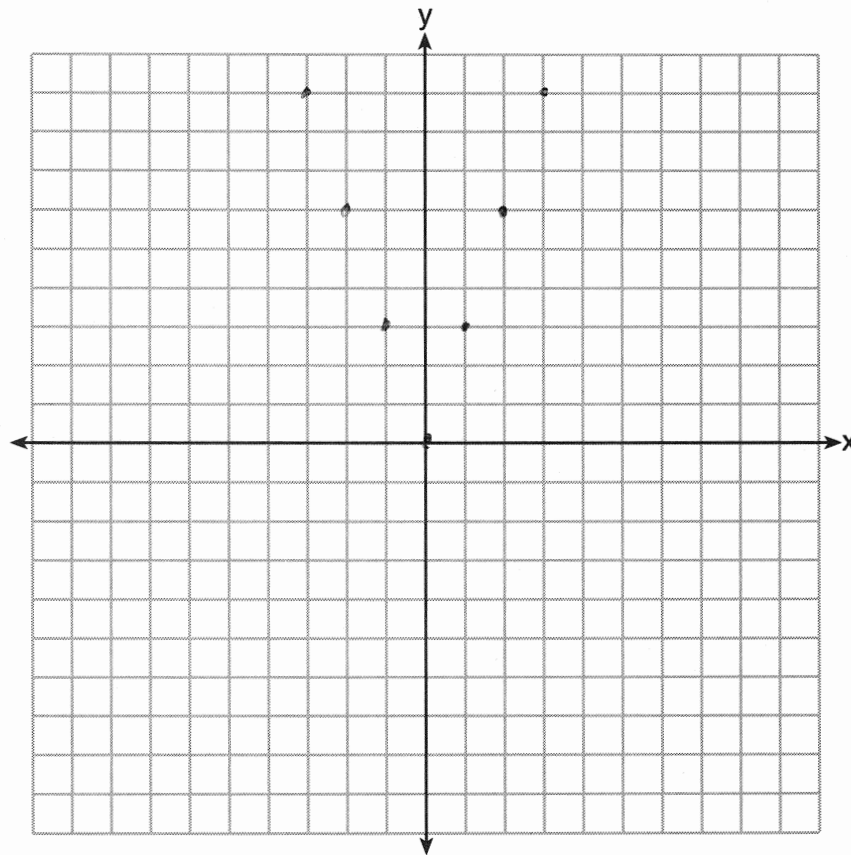
Explain how the value of c is determined.

$$\left(\frac{6}{2}\right)^2$$

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. 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 On the axes below, graph $f(x) = |3x|$.



If $g(x) = f(x) - 2$, how is the graph of $f(x)$ translated to form the graph of $g(x)$?

Shift down 2 units

If $h(x) = f(x - 4)$, how is the graph of $f(x)$ translated to form the graph of $h(x)$?

Shift right 4 units

34 The formula for the area of a trapezoid is $A = \frac{1}{2}h(b_1 + b_2)$. Express b_1 in terms of A , h , and b_2 .

$$2A = h(b_1 + b_2)$$

$$\frac{2A}{h} = b_1 + b_2$$

$$\frac{2A}{h} - b_2 = b_1$$

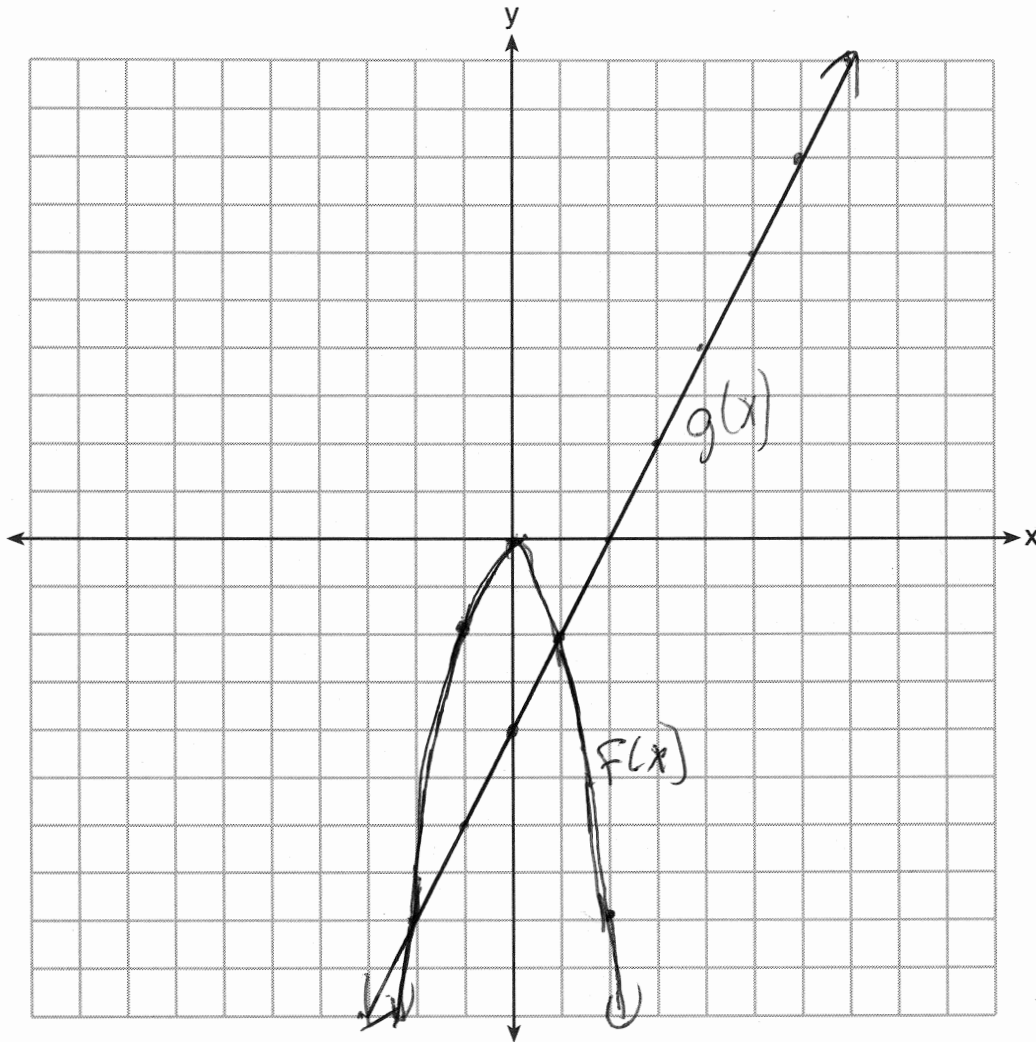
The area of a trapezoid is 60 square feet, its height is 6 ft, and one base is 12 ft. Find the number of feet in the other base.

$$\frac{2(60)}{6} - 12$$

$$20 - 12$$

$$8$$

35 Let $f(x) = -2x^2$ and $g(x) = 2x - 4$. On the set of axes below, draw the graphs of $y = f(x)$ and $y = g(x)$.



Using this graph, determine and state *all* values of x for which $f(x) = g(x)$.

-2, 1

- 36 A school is building a rectangular soccer field that has an area of 6000 square yards. The soccer field must be 40 yards longer than its width. Determine algebraically the dimensions of the soccer field, in yards.

$$w(w+40) = 6000$$

$$w^2 + 40w - 6000 = 0$$

$$(w+100)(w-60) = 0$$

$$w = 60$$

$$l = 100$$

Part IV

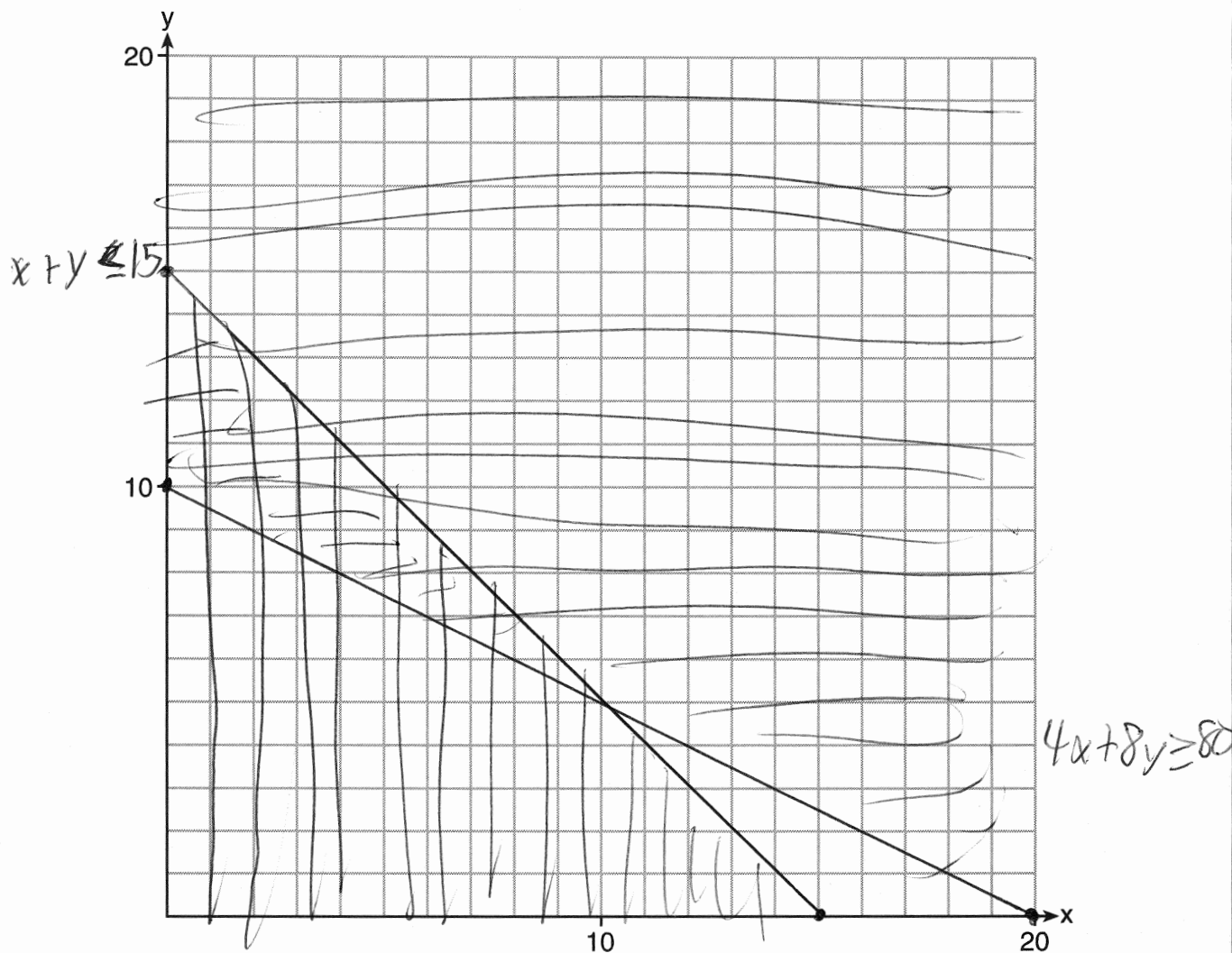
Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be written in pencil. [6]

37 Edith babysits for x hours a week after school at a job that pays \$4 an hour. She has accepted a job that pays \$8 an hour as a library assistant working y hours a week. She will work both jobs. She is able to work *no more than* 15 hours a week, due to school commitments. Edith wants to earn *at least* \$80 a week, working a combination of both jobs.

Write a system of inequalities that can be used to represent the situation.

$$x + y \leq 15 \qquad 4x + 8y \geq 80$$

Graph these inequalities on the set of axes below.



Question 37 is continued on the next page.

Question 37 continued

Determine and state one combination of hours that will allow Edith to earn *at least* \$80 per week while working *no more than* 15 hours.

$(1, 10)$