The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I (Common Core)

Thursday, June 16, 2016 — 9:15 a.m. to 12:15 p.m., only

Student Name: _Steve Watson_

School Name: _www. JMAP. org_

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 for 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.

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]

Difference of Perfect Squares

Use this space for computations.

1 The expression $x^4 - 16$ is equivalent to

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

(2) $(x^2 - 8)(x^2 - 8)$ (4) $(x^2 - 4)(x^2 - 4)$

$a^2 - b^2 = (a+b)(a-b)$

$x^4 - 16 = (x^2 + 4)(x^2 - 4)$

highest exponent of a variable is 5

2 An expression of the fifth degree is written with a leading coefficient of seven and a constant of six. Which expression is correctly written for these conditions?

(1) $6x^5 + x^4 + 7$ (3) $6 - x^5 + 6$

(2) $7 - 6x^4 + 8$ (4) $7x^5 + 2x^2 + 6$ ← *constant is 6*

leading coefficient is 7   highest exponent is 5

3 The table below shows the year and the number of households in a building that had high-speed broadband internet access.

$M = \dfrac{y_2 - y_1}{x_2 - x_1}$

Number of Households	11	16	23	33	42	47
Year	2002	2003	2004	2005	2006	2007

For which interval of time was the average rate of change the *smallest*?

(1) 2002 – 2004   *6*   (3) 2004 – 2006   *9½*

(2) 2003 – 2005   *8½*   (4) 2005 – 2007   *7*

$(1)\ m = \dfrac{23 - 11}{2004 - 2002} = \dfrac{12}{2} = 6$ $(3)\ m = \dfrac{42 - 23}{2006 - 2004} = \dfrac{19}{2} = 9\frac{1}{2}$

$(2)\ m = \dfrac{33 - 16}{2005 - 2003} = \dfrac{17}{2} = 8\frac{1}{2}$ $(4)\ m = \dfrac{47 - 33}{2007 - 2005} = \dfrac{14}{2} = 7$

4 The scatterplot below compares the number of bags of popcorn and the number of sodas sold at each performance of the circus over one week.

Popcorn Sales and Soda Sales
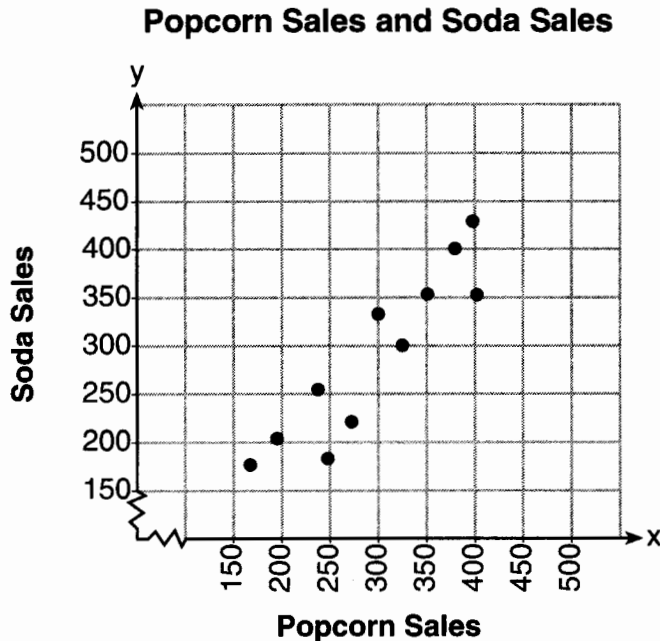
Which conclusion can be drawn from the scatterplot?

(1) There is a negative correlation between popcorn sales and soda sales.

(2) There is a positive correlation between popcorn sales and soda sales.

(3) There is no correlation between popcorn sales and soda sales.

(4) Buying popcorn causes people to buy soda.

5 The Celluloid Cinema sold 150 tickets to a movie. Some of these were child tickets and the rest were adult tickets. A child ticket cost $7.75 and an adult ticket cost $10.25. If the cinema sold $1470 worth of tickets, which system of equations could be used to determine how many adult tickets, a, and how many child tickets, c, were sold?

(1) $a + c = 150$
$10.25a + 7.75c = 1470$

(2) $a + c = 1470$
$10.25a + 7.75c = 150$

(3) $a + c = 150$
$7.75a + 10.25c = 1470$

(4) $a + c = 1470$
$7.75a + 10.25c = 150$

1st sentence
$a + c = 150$

2nd sentence
$10.25a + 7.75c = 1470$

6 The tables below show the values of four different functions for given values of x.

x	f(x)
1	12
2	19
3	26
4	33

(handwritten: >7, >7, >7)

x	g(x)
1	−1
2	1
3	5
4	13

(handwritten: >2, >3, >8)

x	h(x)
1	9
2	12
3	17
4	24

(handwritten: >3, >5, >7)

x	k(x)
1	−2
2	4
3	14
4	28

(handwritten: >6, >10, >14)

Which table represents a linear function?

(1) $f(x)$ *(circled)*

(2) $g(x)$

(3) $h(x)$

(4) $k(x)$

(handwritten:) A linear function must have a constant rate of change.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

$f(x)$ is the only table that shows a constant rate of change

7 The acidity in a swimming pool is considered normal if the average of three pH readings, p, is defined such that $7.0 < p < 7.8$. If the first two readings are 7.2 and 7.6, which value for the third reading will result in an overall rating of normal?

(1) 6.2   *(handwritten: 14.8+6.2 = 21)*

(2) 7.3   *(circled)* *(handwritten: 14.8+7.3 = 22.1)*

(3) 8.6   *(handwritten: 14.8+8.6 = 23.4)*

(4) 8.8   *(handwritten: 14.8+8.8 = 23.6)*

(handwritten:)
$$p = \frac{p_1 + p_2 + p_3}{3}$$

$$3p = p_1 + p_2 + p_3$$

$$3(7) < 3p < 3(7.8)$$

$$21 < 14.8 + p_3 < 23.4$$

$$P_1 + P_2 = 14.8$$

8 Dan took 12.5 seconds to run the 100-meter dash. He calculated the time to be approximately

(1) 0.2083 minute   *(circled)*

(2) 750 minutes

(3) 0.2083 hour

(4) 0.52083 hour

(handwritten:) $\dfrac{12.5 \text{ seconds}}{60 \text{ second per minute}} = .208\overline{3} \text{ minutes}$

9 When $3x + 2 \le 5(x - 4)$ is solved for x, the solution is

(1) $x \le 3$

(2) $x \ge 3$

(3) $x \le -11$

(4) $x \ge 11$ *(circled)*

(handwritten:)
$$3x + 2 \le 5(x - 4)$$
$$3x + 2 \le 5x - 20$$
$$22 \le 2x$$
$$11 \le x$$
$$x \ge 11$$

10 The expression $3(x^2 - 1) - (x^2 - 7x + 10)$ is equivalent to

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

(2) $2x^2 + 7x - 13$

(3) $2x^2 - 7x + 9$

(4) $2x^2 + 7x - 11$

$3(x^2-1)-(x^2-7x+10)$
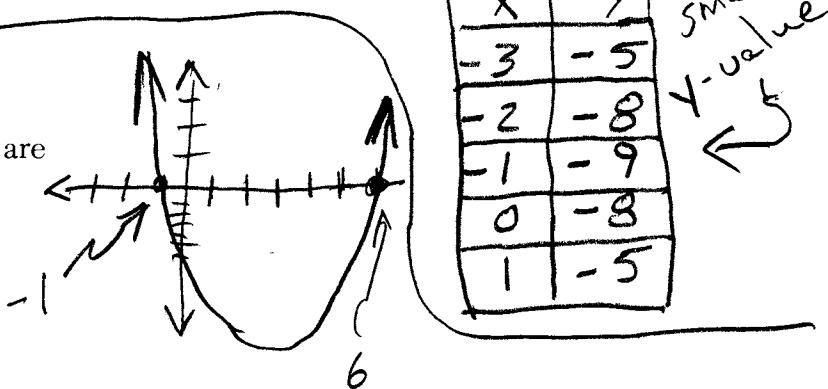
$3x^2-3-x^2+7x-10$

$2x^2 \qquad +7x-13$

11 The range of the function $f(x) = x^2 + 2x - 8$ is all real numbers

(1) less than or equal to -9

(2) greater than or equal to -9

(3) less than or equal to -1

(4) greater than or equal to -1

range of y

domain of x

X	Y
-3	-5
-2	-8
-1	-9
0	-8
1	-5

smallest y-value

values of X when Y = zero.

12 The zeros of the function $f(x) = x^2 - 5x - 6$ are

(1) -1 and 6

(2) 1 and -6

(3) 2 and -3

(4) -2 and 3

-1

6

13 In a sequence, the first term is 4 and the common difference is 3. The fifth term of this sequence is

(1) -11

(2) -8

(3) 16

(4) 19

4　7　10　13　16

1rst　2nd　3rd　4th　5th

Term　　　　　　　　Term

14 The growth of a certain organism can be modeled by $C(t) = 10(1.029)^{24t}$, where $C(t)$ is the total number of cells after t hours. Which function is approximately equivalent to $C(t)$?

(1) $C(t) = 240(.083)^{24t}$

(2) $C(t) = 10(.083)^t$

(3) $C(t) = 10(1.986)^t$

(4) $C(t) = 240(1.986)^{\frac{t}{24}}$

$C(t) = 10(1.029)^{24t}$

$C(t) = 10\left(1.029^{24}\right)^t$

$C(t) = 10(1.986)^t$

$1.029^{24} = 1.985953129$

15 A public opinion poll was taken to explore the relationship between age and support for a candidate in an election. The results of the poll are summarized in the table below.

↓

Age	For	Against	No Opinion
21–40	30	12	8
41–60	20	40	15
Over 60	25	35	15

⟵ Total = 30 +12+8 = 50

↑

What percent of the 21–40 age group was for the candidate?

(1) 15   (3) 40

(2) 25   (4) 60

$\dfrac{30 \text{ for}}{50 \text{ total}}$

$\dfrac{30}{50} = \dfrac{x}{100}$

$x = 60$

16 Which equation and ordered pair represent the correct vertex form and vertex for $j(x) = x^2 - 12x + 7$?

(1) $j(x) = (x - 6)^2 + 43,\ (6, 43)$

(2) $j(x) = (x - 6)^2 + 43,\ (-6, 43)$

(3) $j(x) = (x - 6)^2 - 29,\ (6, -29)$

(4) $j(x) = (x - 6)^2 - 29,\ (-6, -29)$

Step 1 Input equation in graphing calculator and find vertex.

Step 2 Eliminate wrong answers.

The vertex has coordinates (6, −29).

17 A student invests $500 for 3 years in a savings account that earns 4% interest per year. No further deposits or withdrawals are made during this time. Which statement does not yield the correct balance in the account at the end of 3 years?

(1) $500(1.04)^3 = 562.432$

(2) $500(1 - .04)^3 = 442.368$

(3) $500(1 + .04)(1 + .04)(1 + .04) = 562.432$

(4) $500 + 500(.04) + 520(.04) + 540.8(.04) = 562.432$

$A = P(1+r)^t$

$A = 500(1 + .04)^3$

$A = 500(1.04)^3$

$A = 500(1.04)(1.04)(1.04)$

Isolate Y

18 The line represented by the equation $4y + 2x = 33.6$ shares a solution point with the line represented by the table below.

Step 1
Use linear regression and the table values to find
$y = .2x + 4.2$

x	y
−5	3.2
−2	3.8
2	4.6
4	5
11	6.4

Step 2 $4y + 2x = 33.6$
$4y = -2x + 33.6$
$y = \dfrac{-2x + 33.6}{4}$

Step 3 _Input both equations in graphing calculator and find solution._

The solution for this system is

(1) $(-14.0, -1.4)$ (3) $(1.9, 4.6)$

(2) $(-6.8, 5.0)$ (4) $(6.0, 5.4)$ ⟵

19 What is the solution of the equation $2(x + 2)^2 - 4 = 28$?

(1) 6, only   (3) 2 and −6

(2) 2, only   (4) 6 and −2

$2(x+2)^2 - 4 = 28$
$2(x^2 + 4x + 4) - 4 = 28$
$2x^2 + 8x + 8 - 4 = 28$
$2x^2 + 8x - 24 = 0$

formula sheet $a = 2 \quad b = 8$
$c = -24$

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

$x = \dfrac{-8 \pm \sqrt{8^2 - 4(2)(-24)}}{2(2)}$

$x = \dfrac{-8 \pm \sqrt{64 + 192}}{4}$

$x = \dfrac{-8 \pm \sqrt{256}}{4}$

$x = \dfrac{-8 \pm 16}{4}$

$x = \dfrac{-8 - 16}{4} \quad x = \dfrac{-8 + 16}{4}$

$x = \dfrac{-24}{4} \quad x = \dfrac{8}{4}$

$x = -6 \quad x = 2$

20 The dot plot shown below represents the number of pets owned by students in a class.

$Q_1 = 2$
$Q_2 = 3$
$Q_3 = 4$
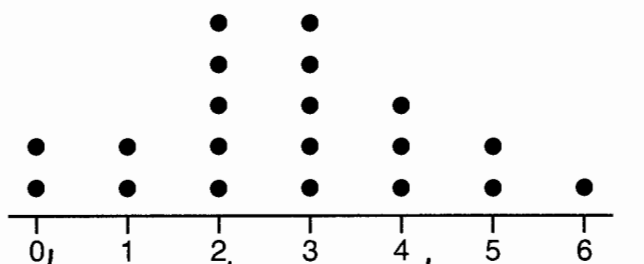
0 0 1 1 2 | 2 2 2 2 2 3 | 3 3 3 3 4 | 4 4 5 5 6

Which statement about the data is _not_ true?

(1) The median is 3. _True_ $Q_2 = 3$

(2) The interquartile range is 2. _True_ $Q_3 - Q_1 = 2$

(3) The mean is 3. _Not true_ $\bar{X} = \dfrac{55}{20} = 2.75$

(4) The data contain no outliers. _True_

21 What is the largest integer, x, for which the value of $f(x) = 5x^4 + 30x^2 + 9$ will be greater than the value of $g(x) = 3^x$?

(1) 7   (3) 9

(2) 8   (4) 10

Step 2 ~~Inspect~~ table of values

X	$f(x)$	$g(x)$
7	13484	2187
8	22409	6561
9	35244	19683
10	53009	59049

Step 1 Strategy: Input both functions in a graphing calculator

22 The graphs of the functions $f(x) = |x - 3| + 1$ and $g(x) = 2x + 1$ are drawn. Which statement about these functions is true?

(1) The solution to $f(x) = g(x)$ is 3.

(2) The solution to $f(x) = g(x)$ is 1.

(3) The graphs intersect when $y = 1$.

(4) The graphs intersect when $x = 3$.

The graphs intersect at (1, 3)
(x, y)

Step 1 Input both function in graphing calculator + inspect graph and table views to find solutions or intersections.

Step 2 Eliminate wrong answers

23 A store sells self-serve frozen yogurt sundaes. The function $C(w)$ represents the cost, in dollars, of a sundae weighing w ounces. An appropriate domain for the function would be

(1) integers — *negative numbers make no sense*

(2) rational numbers — *negative fractions make no sense*

(3) nonnegative integers — *this is good*

(4) nonnegative rational numbers — *this is better*

24 Sara was asked to solve this word problem: "The product of two consecutive integers is 156. What are the integers?"

What type of equation should she create to solve this problem?

(1) linear   (3) exponential

(2) quadratic   (4) absolute value

Let (X) represent the first integer.
Let (X+1) represent the next consecutive integer.
Write (x)(x+1) = 156
$$x^2 + x = 156$$
$$x^2 + x - 156 = 0$$
This is a quadratic equation

Algebra I (Common Core) – June '16   [8]

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 Given that $f(x) = 2x + 1$, find $g(x)$ if $g(x) = 2[f(x)]^2 - 1$.

Answer

$$g(x) = 2(2x+1)^2 - 1$$

or

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

$$g(x) = 8x^2 + 8x + 2 - 1$$

$$g(x) = 8x^2 + 8x + 1$$

26 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

$$3\sqrt{2} \cdot 8\sqrt{18}$$

$$3 \cdot 8 \cdot \sqrt{2} \cdot \sqrt{18}$$

$$24 \cdot \sqrt{36}$$

$$24 \cdot 6$$

$$144$$

Answer

The product is rational because 144 can be expressed as $\frac{144}{1}$, which is a ratio of two integers.

27 On the set of axes below, draw the graph of $y = x^2 - 4x - 1$.

X	Y
-1	4
0	-1
1	-4
2	-5
3	-4
4	-1
5	4

(-1, 4) (5, 4)

axis of symmetry

$y = x^2 - 4x - 1$

(0, -1) (4, -1)

(1, -4) (3, -4)

(2, -5)
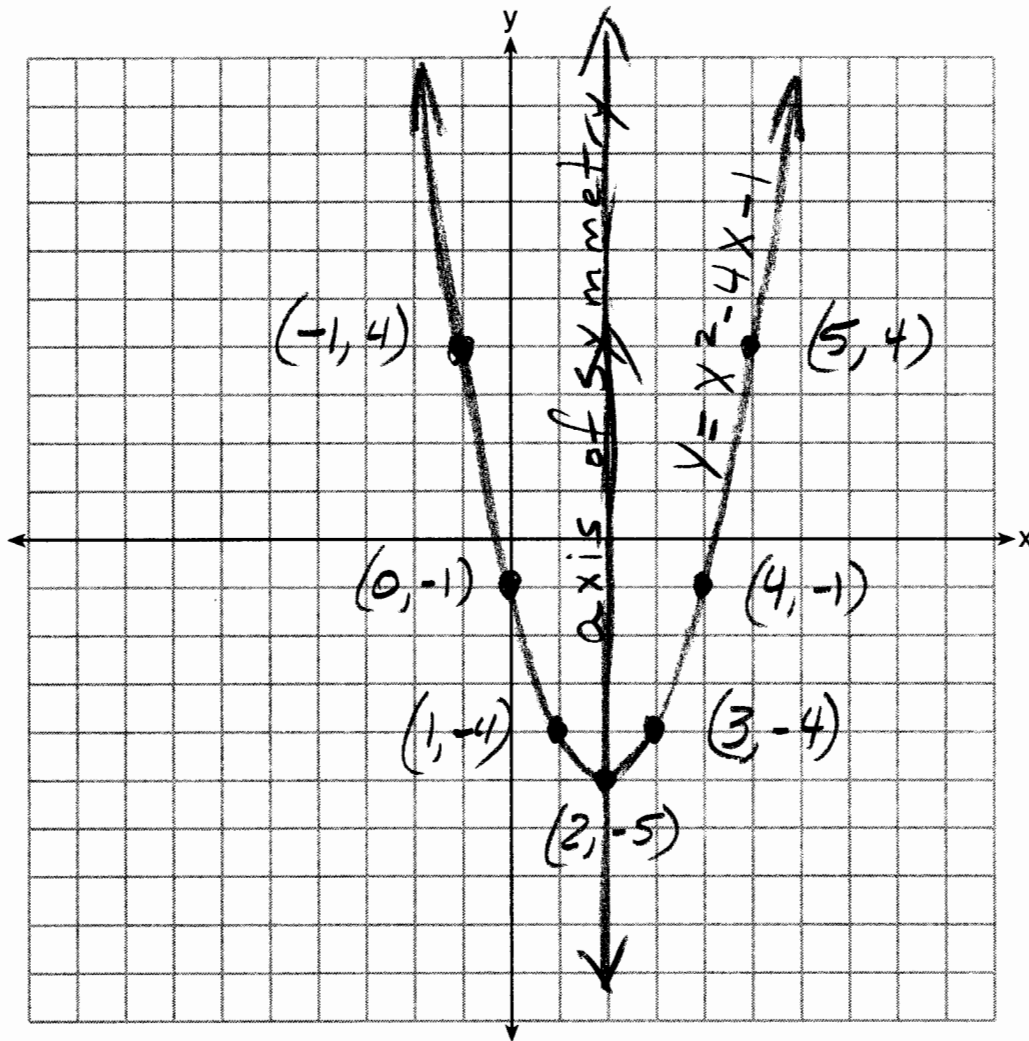
State the equation of the axis of symmetry.

answer

$X = 2$

28 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and -6. Do you agree with Amy's solutions? Explain why or why not.

Strategy #1
Substitution
$\left(\frac{7}{2}\right)$

$2x^2 + 5x - 42 = 0$

$2\left(\frac{7}{2}\right)^2 + 5\left(\frac{7}{2}\right) - 42 = 0$

$2\left(\frac{49}{4}\right) + \frac{35}{2} - 42 = 0$

$\frac{98}{4} + 17.5 - 42 = 0$

$24.5 + 17.5 - 42 = 0$

$42 - 42 = 0$

$\quad 0 = 0 \checkmark$

(-6)

$2x^2 + 5x - 42 = 0$

$2(-6)^2 + 5(-6) - 42 = 0$

$2(36) - 30 - 42 = 0$

$72 - 72 = 0$

$\quad 0 = 0 \checkmark$

Amy's solutions make the equation true. I agree with Amy.

Strategy #2
Complete the Square

$2x^2 + 5x - 42 = 0$

$x^2 + \frac{5}{2}x - 21 = 0$

$x^2 + \frac{5}{2}x = 21$

$\left(x + \frac{5}{4}\right)^2 = 21 + \left(\frac{5}{4}\right)^2$

$\left(x + \frac{5}{4}\right)^2 = 21 + \frac{25}{16}$

$\left(x + \frac{5}{4}\right)^2 = \frac{336 + 25}{16}$

$\left(x + \frac{5}{4}\right)^2 = \frac{361}{16}$

$x + \frac{5}{4} = \pm\sqrt{\frac{361}{16}}$

$x + \frac{5}{4} = \pm\frac{19}{4}$

$x = \frac{-5}{4} \pm \frac{19}{4}$

$x = \frac{14}{4} \quad \Big| \quad x = \frac{-24}{4}$

$x = \frac{7}{2} \checkmark \quad \Big| \quad x = -6 \checkmark$

I agree. Amy's solutions are correct. Solving the equation by completing the square produces the same solutions

---

Strategy #3
Factor by Grouping

$2x^2 + 5x - 42 = 0$

$|ac| = 84$
Factors of 84

$\quad 1 \cdot 84$
$\quad 2 \cdot 42$
$\quad 3 \cdot 28$
$\quad 4 \cdot 21$
$\quad 6 \cdot 14$
$\quad \boxed{12 \cdot 7}$

Replace $5x$ with $12x - 7x$

$2x^2 + 12x - 7x - 42 = 0$

$(2x^2 + 12x) + (-7x - 42) = 0$

$2x(x+6) - 7(x+6) = 0$

$(2x-7)(x+6) = 0$

$2x - 7 = 0 \quad \Big| \quad x + 6 = 0$

$2x = 7 \quad\quad\ \Big| \quad x = -6 \checkmark$

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

I agree. Amy's solutions are correct. Solving the equation by factoring produces the same solutions.

Note: Only one strategy is required.

29 Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points $(-3,4)$ and $(6,1)$. Sue wrote $y - 4 = -\frac{1}{3}(x + 3)$ and Kathy wrote $y = -\frac{1}{3}x + 3$. Justify why both students are correct.

Sue (Y_1)

$$Y_1 - 4 = -\frac{1}{3}(x+3)$$

$$Y_1 = -\frac{1}{3}(x+3) + 4$$

Kathy (Y_2)

$$Y_2 = -\frac{1}{3}X + 3$$

Input both equations in a graphing calculator and inspect the graphs and tables.

X	Y_1	Y_2
-6	5	5
-3	4	4
0	3	3
3	2	2
6	1	1

Answer

Both students are correct, because the graphs of both equations pass through the points $(-3,4)$ and $(6,1)$. The equations describe the same relationship between the X and y variables.

30 During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?
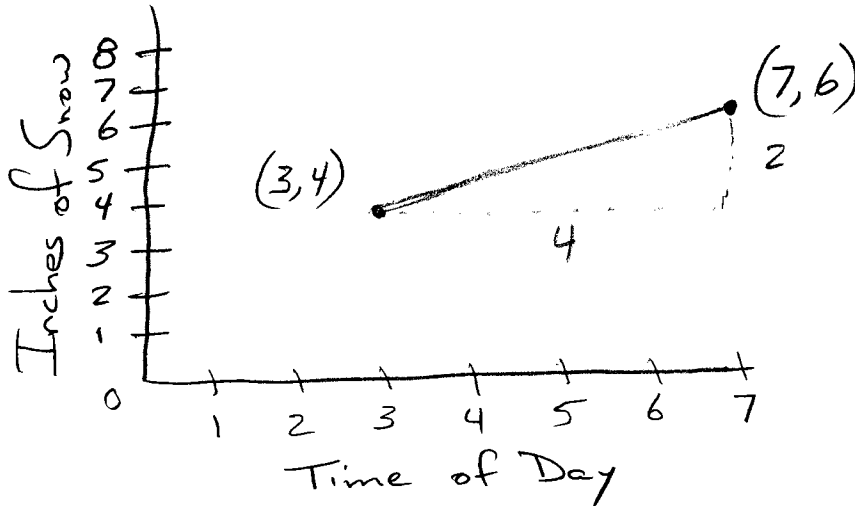
$$slope = \frac{rise}{run} = \left(\frac{2}{4}\right) = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-4}{7-3} = \left(\frac{2}{4}\right)$$

Answer

In the context of this problem, the slope of the line represents the rate of snow falling per hour. The rate of $\frac{2 \text{ inches of snow}}{4 \text{ hours}}$ means that it is snowing at an average rate of $\frac{1}{2}$ inch per hour.

31 The formula for the sum of the degree measures of the interior angles of a polygon is $S = 180(n - 2)$. Solve for n, the number of sides of the polygon, in terms of S.
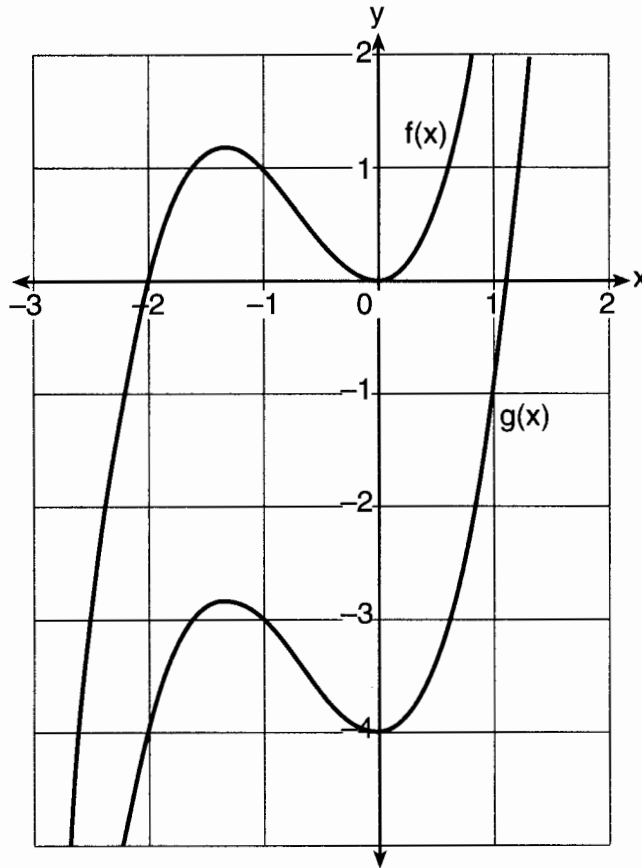
$$S = 180(n - 2)$$

$$S = 180n - 360$$

$$S + 360 = 180n$$

$$\frac{S + 360}{180} = n$$

Answer

32 In the diagram below, $f(x) = x^3 + 2x^2$ is graphed. Also graphed is $g(x)$, the result of a translation of $f(x)$.

Determine an equation of $g(x)$. Explain your reasoning.

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

$f_{(x)}$ has a y-intercept of 0.
$g(x)$ has a y-intercept of -4
Every point on $f_{(x)}$ shifts down 4 units
to create $g(x)$.

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 The height, H, in feet, of an object dropped from the top of a building after t seconds is given by $H(t) = -16t^2 + 144$.

How many feet did the object fall between one and two seconds after it was dropped?

Strategy — Input the function rule in a graphing calculator.

t	$H(t)$
0	144
1	128
2	80
3	0

$H_{(1)} = 128$

$H_{(2)} = 80$

Answer

$H_{(2)} - H_{(1)} = 128 - 80 = \boxed{48}$

Determine, algebraically, how many seconds it will take for the object to reach the ground.

$H_{(t)} = -16t^2 + 144$

$0 = -16t^2 + 144$

$16t^2 = 144$

$t^2 = \dfrac{144}{16}$

$t^2 = 9$

$t = \pm\sqrt{9}$

$t = \pm 3$ reject -3

Answer

$\boxed{3 \text{ seconds}}$

34 The sum of two numbers, x and y, is more than 8. When you double x and add it to y, the sum is less than 14.
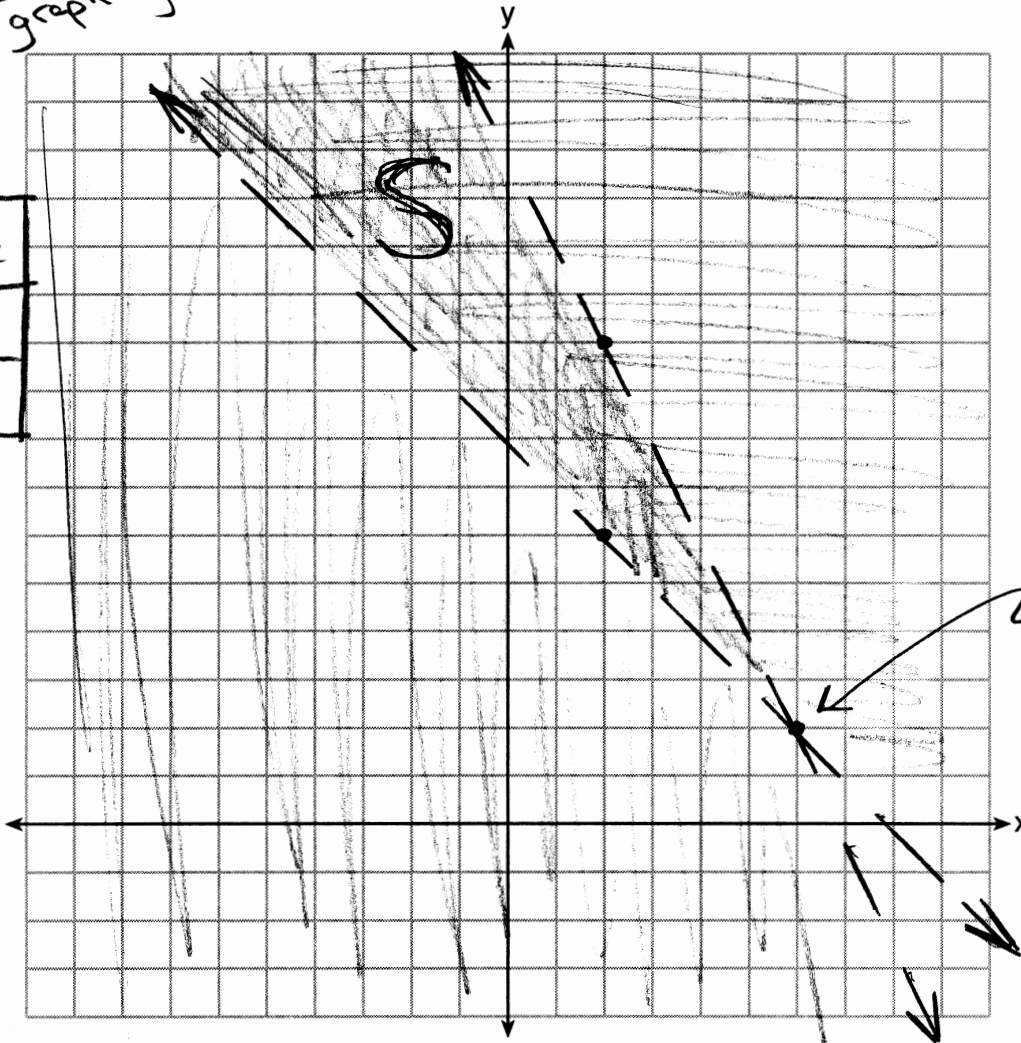
$$x + y_1 > 8 \implies y_1 > -x + 8$$

$$2x + y_2 < 14 \implies y_2 < -2x + 14$$

Step1
Isolate y_1
and y_2

Graph the inequalities that represent this scenario on the set of axes below.

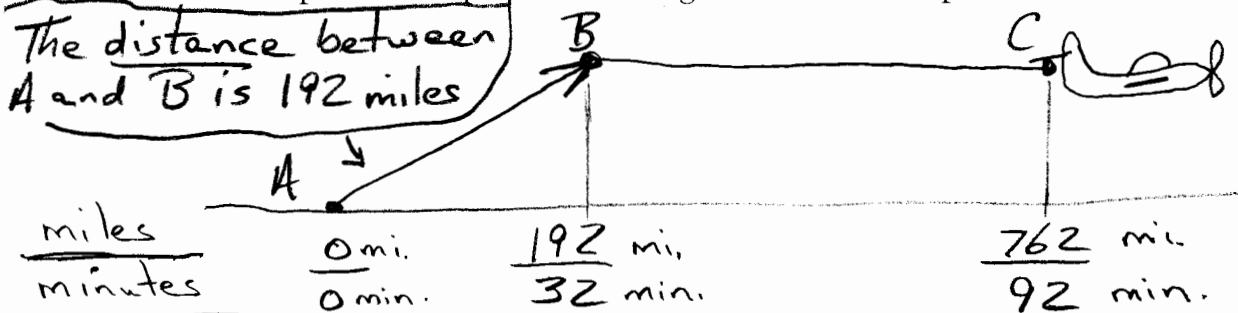Step 2
Input in graphing
calculator

X	Y_1	Y_2
2	6	10
6	2	2

S

(6,2)

Kai says that the point (6,2) is a solution to this system. Determine if he is correct and explain your reasoning.

Kai is _wrong_. The point (6,2) falls on both lines, but the lines themselves are boundaries and are not part of the solution set.

35 An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

The distance between A and B is 192 miles

B   C

A

$$\frac{miles}{minutes}$$

$$\frac{0\ mi.}{0\ min.}$$ $$\frac{192\ mi.}{32\ min.}$$ $$\frac{762\ mi.}{92\ min.}$$

$$\frac{570\ miles}{60\ minutes}$$ $$\frac{570}{60} = \frac{x}{1}$$

The plane flies between B and C at a speed of 9.5 miles per minute   Answer → $$x = 9.5\ \frac{miles}{per\ minute}$$

Write an equation to represent the number of miles the plane has flown, *y*, during *x* minutes at cruising altitude, only.

(This is $\overline{BC}$ in the picture above.)

$$y = 9.5x$$ *x = minutes at cruising altitude.*

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.   2 hours = 120 minutes

$$y = 9.5x + 192$$

Distance flown after cruising altitude.   *Distance flown before cruising altitude*

$$y = 9.5(120-32) + 192$$
$$y = 9.5(88) + 192$$
$$y = 836 + 192$$
$$y = \boxed{1,028\ miles}$$

36 On the set of axes below, graph

$$g(x) = \frac{1}{2}x + 1$$

and

$$f(x) = \begin{cases} 2x + 1, & x \le -1 \\ 2 - x^2, & x > -1 \end{cases}$$

STEP 1 Plot
g(x) = ½ x + 1

STEP 2 Plot
f(x) = 2X+1 over
the interval X ≤ -1

STEP 3 Plot
f(x) = 2-X² over
the interval X > -1

f(x) is discontinuous

intersection

g(x)

f(x)

f(x)
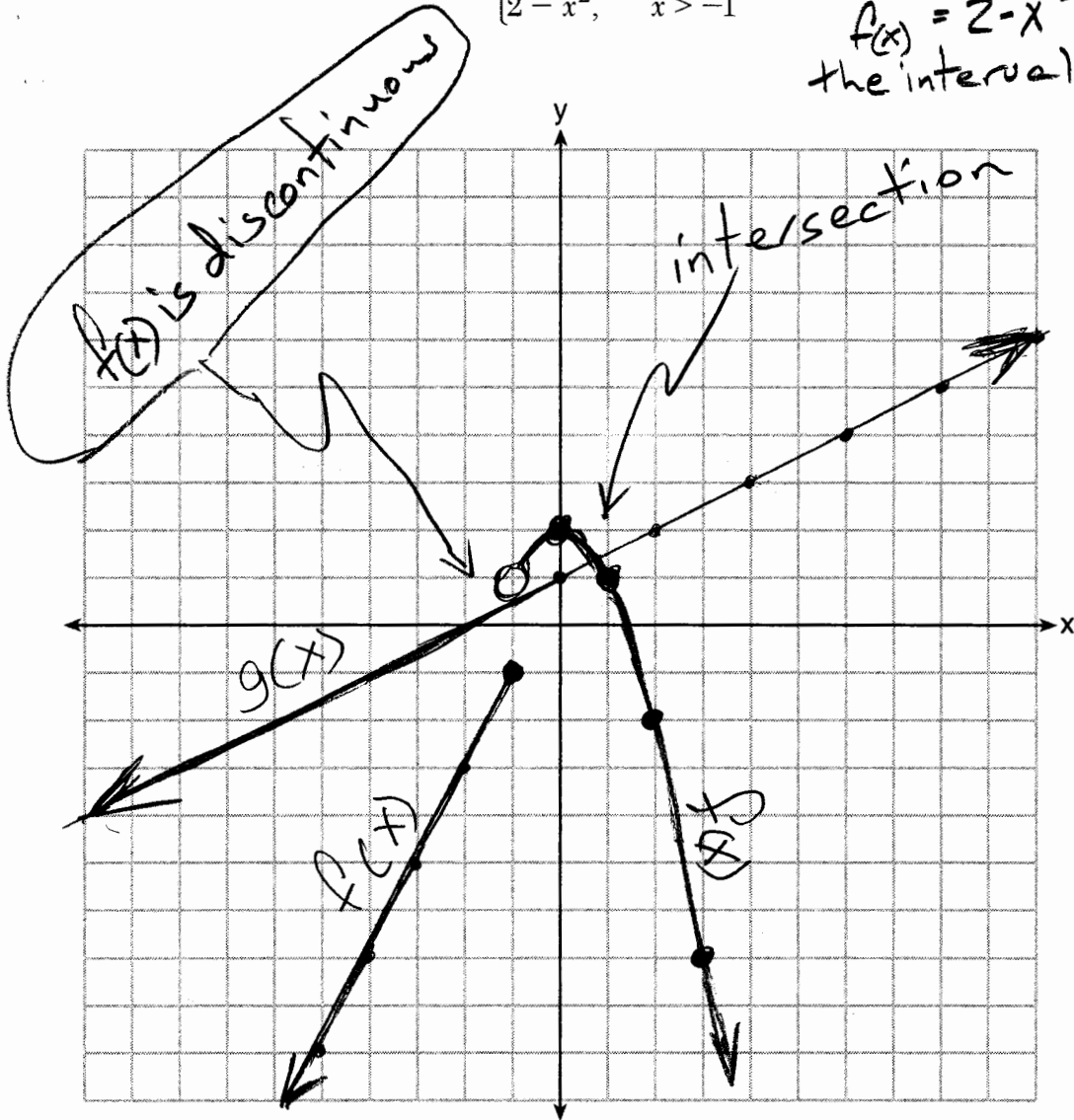
How many values of x satisfy the equation $f(x) = g(x)$? Explain your answer, using evidence from your graphs.

1 answer

The graphs intersect at only one point.

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 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let x equal the price of one package of cupcakes and y equal the price of one package of brownies.

Write a system of equations that describes the given situation.

$$Y_1 \quad 3c + 2b = 19 \qquad\qquad Y_1 \quad 3x + 2y = 19$$
$$Y_2 \quad 2c + 4b = 24 \qquad\qquad Y_2 \quad 2x + 4y = 24$$

On the set of axes below, graph the system of equations.
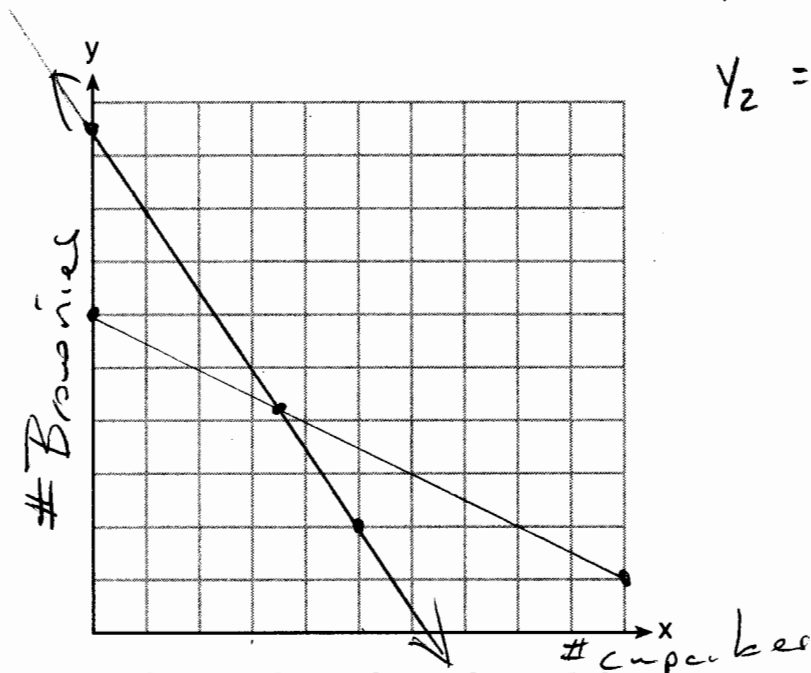
$$X_1 = \frac{19 - 3X}{2}$$

$$Y_2 = \frac{24 - 2X}{4}$$

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

$$2(Y_1) \quad 6X + 4y = 38$$
$$-(Y_2) \quad 2x + 4y = 24$$
$$\overline{ 4X = 14}$$
$$X = \frac{14}{4}$$
$$X = \frac{7}{2}$$
$$X = \boxed{\$3.50} \checkmark$$

Cost of Package of Cupcakes

$$Y_2 \quad 2(3.5) + 4y = 24$$
$$7 + 4y = 24$$
$$4y = 17$$
$$y = \frac{17}{4}$$
$$y = \boxed{\$4.25}$$

Cost of Package of Brownies