

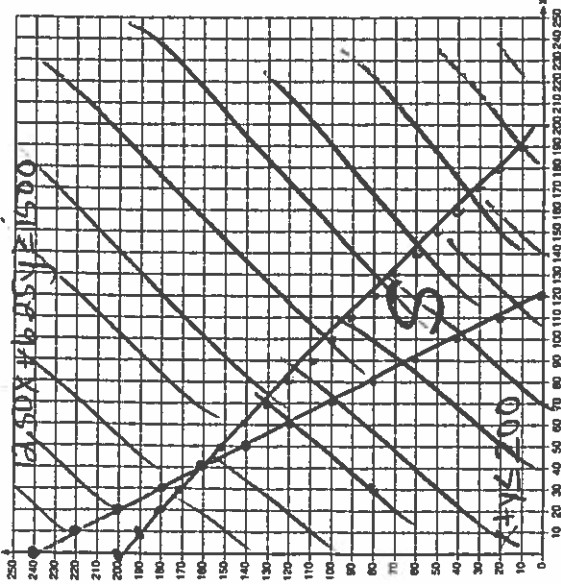
Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. 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. The Reel Good Cinema is conducting a mathematical study. In its theater, there are 200 seats. Adult tickets cost \$12.50 and child tickets cost \$6.25. The cinema's goal is to sell at least \$1500 worth of tickets for the theater.

Write a system of linear inequalities that can be used to find the possible combinations of adult tickets,  $x$ , and child tickets,  $y$ , that would satisfy the cinema's goal.

$x + y \leq 200$   
 $12.50x + 6.25y \geq 1500$   
 $17.50x + 6.25y \geq 1500$   
 $12.50x + 6.25y \geq 1500$   
 $12.50x + 6.25y \geq 1500$   
 $12.50x + 6.25y \geq 1500$

Graph the solution to this system of inequalities on the set of axes below. Label the solution with an  $S$ .



$x + y \leq 200$   
 $-x$   
 $y \leq -x + 200$   
 child

Marta claims that selling 30 adult tickets and 80 child tickets will result in meeting the cinema's goal. Explain whether she is correct or incorrect, based on the graph drawn.

She is incorrect b/c it's not in the double shaded region.

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 in the space provided. [48]

1. The expression  $x^2 - 16$  is equivalent to
- (1)  $(x^2 + 8)(x^2 - 8)$
  - (2)  $(x^2 - 8)(x^2 - 8)$
  - (3)  $(x^2 + 4)(x^2 - 4)$
  - (4)  $(x^2 - 4)(x^2 - 4)$

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?

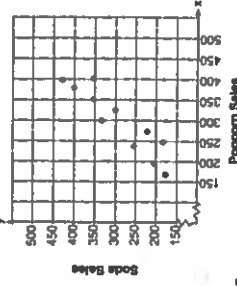
- (1)  $6x^5 + x^4 + 7$
- (2)  $7x^5 - 6x^4 + 5$
- (3)  $6x^5 - x^5 + 5$
- (4)  $7x^5 + 2x^2 + 6$

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

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

- For which interval of time was the average rate of change the smallest?
- (1) 2002 - 2004
  - (2) 2003 - 2005
  - (3) 2004 - 2006
  - (4) 2005 - 2007

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



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)  $a + c = 150$
  - (2)  $10.25a + 7.75c = 1470$
  - (3)  $a + c = 150$
  - (4)  $10.25a + 7.75c = 1470$

ALGEBRA I  
June 2016

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

$x$	$f(x)$	$g(x)$	$h(x)$	$k(x)$
1	12	1	8	1
2	19	2	12	2
3	26	3	17	3
4	33	4	24	4

Which table represents a linear function?

- (1)  $f(x)$  (2)  $g(x)$  (3)  $h(x)$  (4)  $k(x)$  6 1

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 (2) 7.3 (3) 8.6 (4) 8.8 7 2

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

- (1) 0.2083 minute  $\approx 12.5 \div 60$  (2) 0.2083 hour  $\frac{3 \times 12.5}{60} = 0.625$   
 (3) 0.2083 hour  $\frac{3 \times 12.5}{60} = 0.625$  (4) 0.52083 hour  $\frac{3 \times 12.5}{60} = 0.625$  1

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

- (1)  $x \leq 3$  (2)  $x \geq 3$  (3)  $x \leq -11$  (4)  $x \geq 11$  2

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

- (1)  $2x^2 - 7x + 7$  (2)  $2x^2 - 7x + 9$  (3)  $2x^2 - 7x + 9$   
 (4)  $2x^2 + 7x - 13$  2

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  $-1$  2

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

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)  $19$  3

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)  $C(t) = 10(1.986)^t$   
 (3)  $C(t) = 240(1.986)^{24t}$  (4)  $C(t) = 240(1.986)^{24t}$  3

ALGEBRA I  
June 2016

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	Fav	Against	No Opinion
21-40	30	12	8
41-60	20	40	15
Over 60	25	35	15

$\frac{30}{50} = 0.6 (100\%)$   
 $60\%$

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

- (1) 15 (2) 25 (3) 40 (4) 60 4

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

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)  $500(1.04)^3$  (2)  $500(1 + .04)(1 + .04)(1 + .04)$   
 (3)  $500(1 + .04)^3$  (4)  $500 + 500(.04) + 520(.04) + 540.8(.04)$  2

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

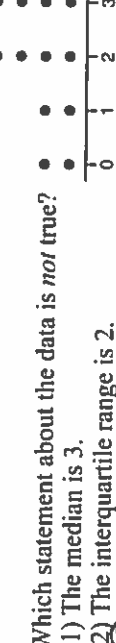
x	y
-5	3.2
-2	3.8
2	4.6
4	5
11	6.4

$4y + 2x = 33.6$   
 $4y - 2x = -2x + 33.6$   
 $8y = 14x + 33.6$   
 $y = \frac{14x + 33.6}{8}$   
 LINREG  $y = .2x + 4.2$   
 $100x + 42 = 18.4$   
 $100x = 18.4 - 42 = -23.6$   
 $x = -0.236$   
 $y = .2(-0.236) + 4.2 = 4.1528$

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

- (1) 6, only (2) 2, only (3) 2 and -6 (4) 6 and -2 3

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



Which statement about the data is not true?  
 (1) The median is 3. (2) The interquartile range is 2. (3) The mean is 3. (4) The data contain no outliers. 3

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 (2) 8 (3) 9 (4) 10 3

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  $x = 3$ .
- put into look calc table at table* 22 2

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
  - (2) rational numbers
  - (3) nonnegative integers
  - (4) nonnegative rational numbers
- domain* 23 4

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
  - (2) quadratic
  - (3) exponential
  - (4) absolute value
- X(X+1) = X^2 + X* 24 2

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  $g(x) = 2[f(x)]^2 - 1$ .

*2x - 1*

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

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

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

$8x^2 - 8x + 2 - 1 \rightarrow 8x^2 - 8x + 1$

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

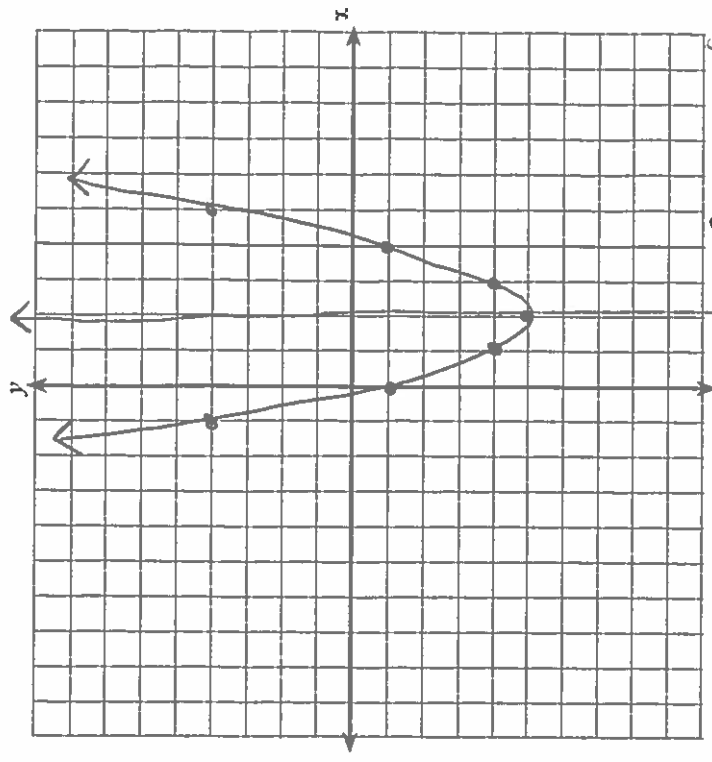
$3\sqrt{2} \cdot 8\sqrt{18}$

$24\sqrt{36}$

$24 \cdot 6 = 144$

*rational - whole # (integer)*

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



State the equation of the axis of symmetry.

*x = 2 axis of sym*

$x = 2$

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.

*a = 2*  
*b = 5*  
*c = -42*

$$x = \frac{-5 \pm \sqrt{5^2 - 4(2)(-42)}}{2(2)}$$

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

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

*Yes she is right b/c using the quad formula I got the same solutions.*

$x = \frac{-5 + 19}{4} = 3.5$

$x = \frac{-5 - 19}{4} = -6$

ALGEBRA I

June 2016

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

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

Kathy

$$y = -\frac{1}{3}x + 3$$

Both are correct b/c when I graphed them both the tables were the same.

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?

$$4 \text{ in} \rightarrow 6 \text{ in.} \quad \frac{6-4}{7-3} = \frac{2}{4} = \frac{1}{2}$$

$$3 \text{ pm} \rightarrow 7 \text{ pm}$$

The snow fell 1 inch every 2 hours  
(or 1/2 in. every 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  $S$ .

$$S = 180(n - 2)$$

$$S = 180n - 360$$

$$+360 \quad +360$$

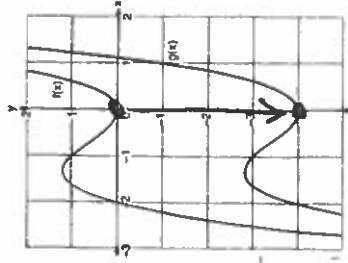
$$\frac{S+360}{180} = \frac{180n}{180}$$

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

ALGEBRA I

June 2016

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



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

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

The graph of  $g(x)$  is the same as  $f(x)$  shifted down 4 units.

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?

$$117 \text{ feet}$$

$$128 - 80 = 48$$

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

$$a = -16$$

$$b = 0$$

$$c = 144$$

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

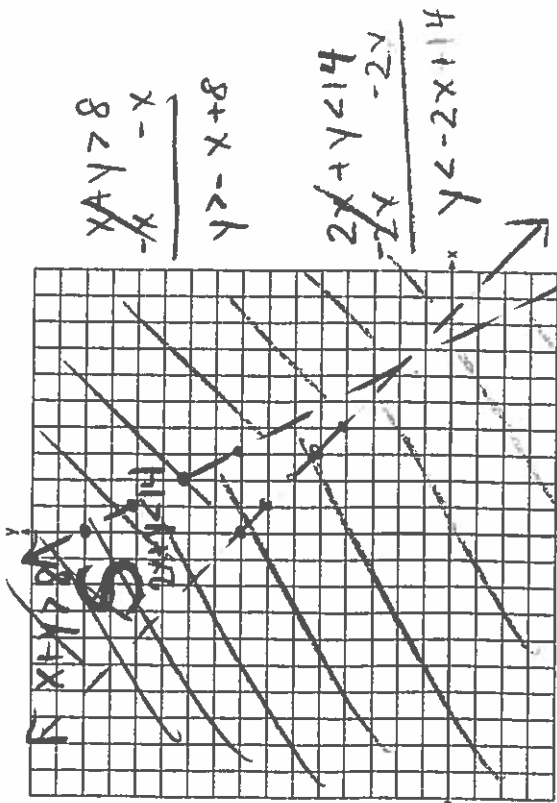
$$t = \frac{0 \pm \sqrt{0^2 - 4(-16)(144)}}{2(-16)}$$

$$t = \frac{\pm \sqrt{9216}}{-32} \rightarrow \sqrt{9216} = 96$$

$$t = \frac{96}{-32} \text{ reject} \rightarrow t = \frac{-96}{-32} \rightarrow t = 3$$

ALGEBRA 1  
June 2016

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



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

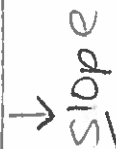
No b/c  $(6, 2)$  is where the lines cross but the lines are dashed meaning not equal to and therefore cannot be a solution.

ALGEBRA 1  
June 2016

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.

$762 - 192 = 570$  miles at cruising altitude  
 $92 - 32 = 60$  minutes at cruising altitude  
 $\frac{570 \text{ miles}}{60 \text{ min}} = 9.5$  miles per min.



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

$y = 9.5x$   
 miles      min.

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.

$192 - 32 = 88$  min  
 $2 \text{ hours} = 120 \text{ min}$   
 $120 - 88 = 32$  min.

$y = 9.5(88)$   
 $y = 836$  miles  
 $+ 192$  miles it flew the 1st 32 min.

36. On the set of axes below, graph

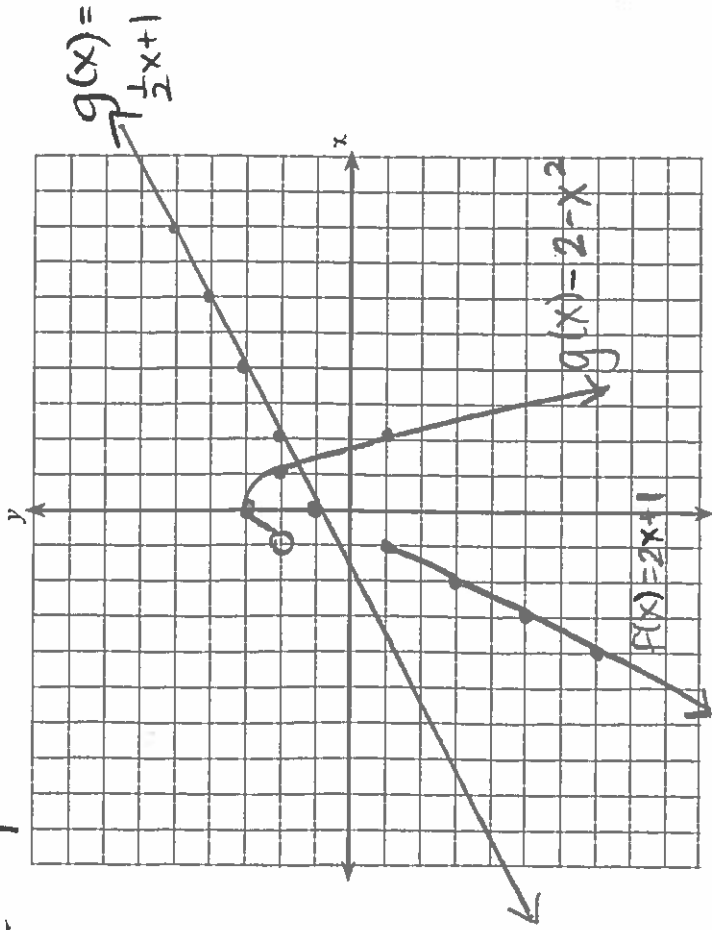
$$g(x) = \frac{1}{2}x + 1$$

and

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

x	y
-4	-7
-3	-5
-2	-3
-1	-1

x	y
-1	1
0	2
1	1
2	-2



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

4 value of  $x$  b/c the graphs only cross once.

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]

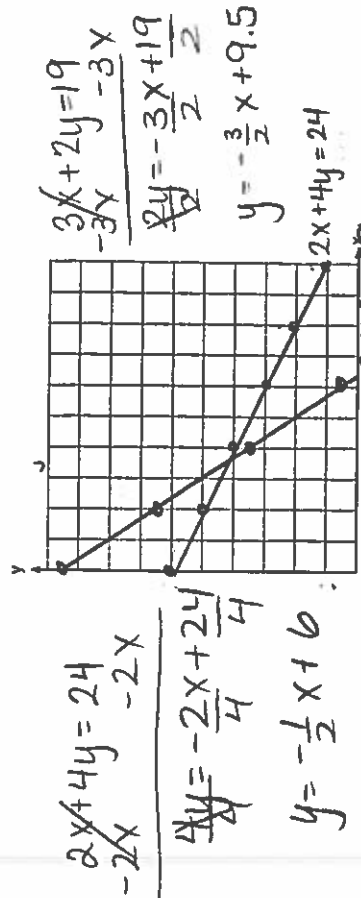
37. Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for \$19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for \$24. Let  $x$  equal the price of one package of cupcakes and  $y$  equal the price of one package of brownies.

Write a system of equations that describes the given situation.

$$\begin{aligned} 3x + 2y &= 19 \\ 2x + 4y &= 24 \end{aligned}$$

$x = \text{cupcakes}$   
 $y = \text{brownies}$

On the set of axes below, graph the system of equations.



$$\begin{aligned} 2x + 4y &= 24 \\ -2x & \quad -2x \end{aligned}$$

$$4y = -\frac{2x + 24}{4}$$

$$y = -\frac{1}{2}x + 6$$

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.

$$\begin{aligned} -2(3x + 2y = 19) &\rightarrow -6x - 4y = -38 \\ 2x + 4y &= 24 \\ \hline -4x &= -14 \end{aligned}$$

$$2(3.50) + 4y = 24$$

$$7 + 4y = 24$$

$$4y = \frac{17}{4} \quad | \quad y = \$4.25$$

$x = \$3.50$