**ALGEBRA I**

v202

Student Name

Mr. Sibol

School Name

John Dewey High School

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.

Use this space for computations.

5 The value of Tony's investment was \$1140 on January 1st. On this date three years later, his investment was worth \$1824. The average rate of change for this investment was \$19 per

- (1) day (3) quarter
 (2) month (4) year

$$\frac{1824 - 1140}{3 - 0} = \frac{\$728}{\text{yr}}$$

6 The solution to $3(x - 8) + 4x = 8x + 4$ is

- (1) 12 (3) -12
 (2) 28 (4) -28

$$\begin{aligned} 3x - 24 + 4x &= 8x + 4 \\ 7x - 24 &= 8x + 4 \\ -28 &= x \end{aligned}$$

$$\frac{\$728}{\text{yr}} \cdot \frac{1 \text{ yr}}{12 \text{ m}} = \$19/\text{m}$$

7 An ice cream shop sells ice cream cones, c , and milkshakes, m . Each ice cream cone costs \$1.50 and each milkshake costs \$2.00. Donna has \$19.00 to spend on ice cream cones and milkshakes. If she must buy 5 ice cream cones, which inequality could be used to determine the maximum number of milkshakes she can buy?

- (1) $1.50(5) + 2.00m \geq 19.00$ (3) $1.50c + 2.00(5) \geq 19.00$
 (2) $1.50(5) + 2.00m \leq 19.00$ (4) $1.50c + 2.00(5) \leq 19.00$

8 When written in standard form, the product of $(3 + x)$ and $(2x - 5)$ is

- (1) $3x - 2$ (3) $2x^2 - 11x - 15$
 (2) $2x^2 + x - 15$ (4) $6x - 15 + 2x^2 - 5x$

$$\begin{aligned} (3 + x)(2x - 5) &= 6x - 15 + 2x^2 - 5x \\ &= 2x^2 + x - 15 \end{aligned}$$

9 If $x = 2$, $y = 3\sqrt{2}$, and $w = 2\sqrt{8}$, which expression results in a rational number?

- (1) $x + y$ (3) $(w)(y)$
 (2) $y - w$ (4) $y \div x$

$$(3) (w)(y) = (2\sqrt{8})(3\sqrt{2}) = 6\sqrt{16} = 24$$

10 Which product is equivalent to $4x^2 - 3x - 27$?

- (1) $(2x + 9)(2x - 3)$ (3) $(4x + 9)(x - 3)$
 (2) $(2x - 9)(2x + 3)$ (4) $(4x - 9)(x + 3)$

$$4x^2 - 12x + 9x - 27$$

Use this space for computations.

11 Given: $f(x) = \frac{2}{3}x - 4$ and $g(x) = \frac{1}{4}x + 1$

Four statements about this system are written below.

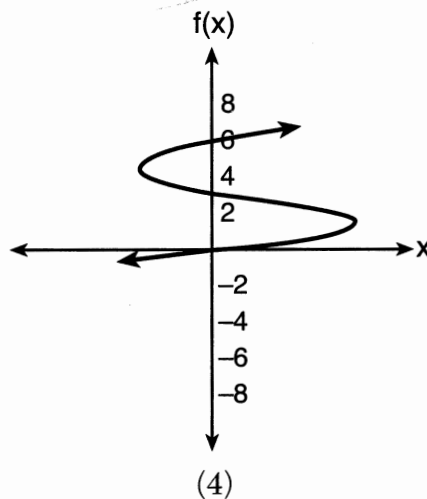
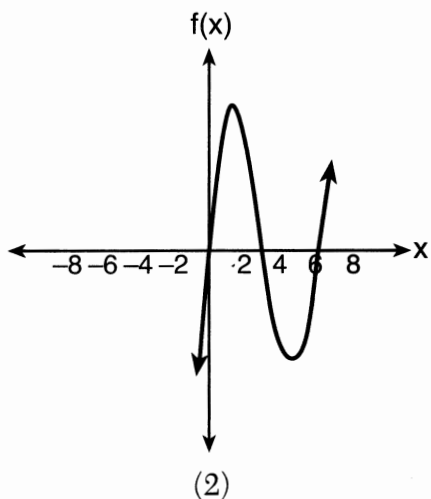
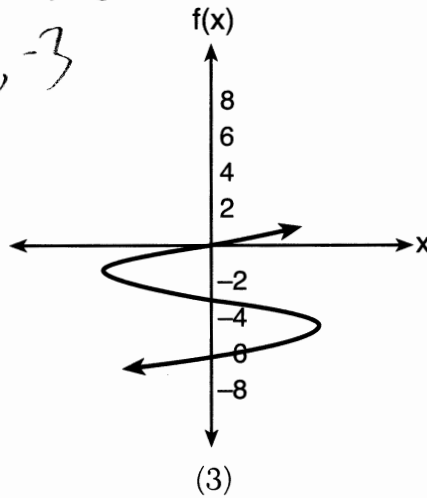
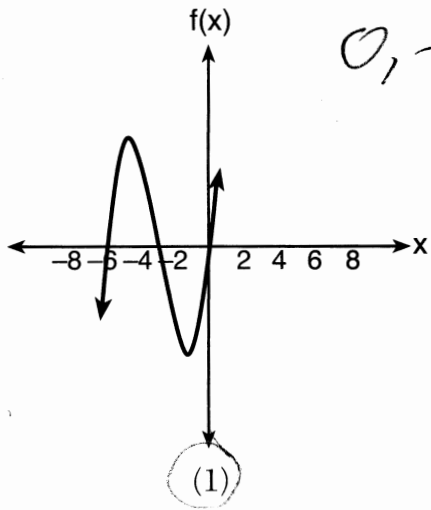
- I. $f(4) = g(4)$ **F** $f(4) = -\frac{4}{3}$ $g(4) = 2$
 II. When $x = 12$, $f(x) = g(x)$. **T**
 III. The graphs of $f(x)$ and $g(x)$ intersect at $(12, 4)$. **T**
 IV. The graphs of $f(x)$ and $g(x)$ intersect at $(4, 12)$. **F**

Which statement(s) are true?

- (1) II, only
 (2) IV, only
 (3) I and IV
 (4) II and III

12 Which sketch represents the polynomial function

$f(x) = x(x + 6)(x + 3)$? Zeros are 0, -6, -3



Use this space for computations.

13 If the parent function of $f(x)$ is $p(x) = x^2$, then the graph of the function $f(x) = (x - k)^2 + 5$, where $k > 0$, would be a shift of

- (1) k units to the left and a move of 5 units up
- (2) k units to the left and a move of 5 units down
- (3) k units to the right and a move of 5 units up
- (4) k units to the right and a move of 5 units down

14 Which expression is equivalent to $(-4x^2)^3$?

- (1) $-12x^6$
- (2) $-12x^5$
- (3) $-64x^6$
- (4) $-64x^5$

15 Which function has the *smallest* y -intercept?

$g(x) = 2x - 6$

(1)
 $b = 6$

$f(x) = \sqrt{x} - 2$

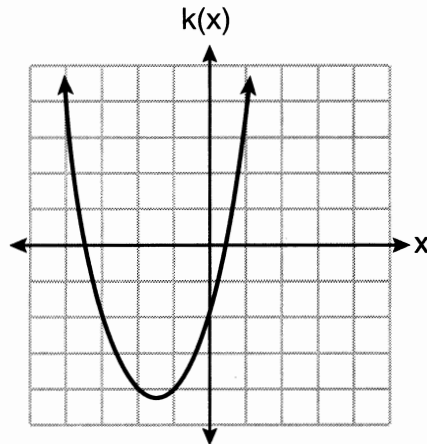
(3)

$b = -2$

x	h(x)
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4

$b = 1$

(2)



$b = -2$

(4)

16 Which domain would be the most appropriate to use for a function that compares the number of emails sent (x) to the amount of data used for a cell phone plan (y)?

- (1) integers
- (2) whole numbers
- (3) rational numbers
- (4) irrational numbers

Use this space for computations.

17 Eric deposits \$500 in a bank account that pays 3.5% interest, compounded yearly. Which type of function should he use to determine how much money he will have in the account at the end of 10 years?

- (1) linear
 (2) quadratic
 (3) absolute value
 (4) exponential

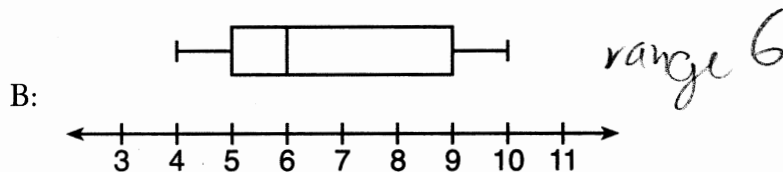
18 Given: the sequence 4, 7, 10, 13,...

When using the arithmetic sequence formula $a_n = a_1 + (n - 1)d$ to determine the 10th term, which variable would be replaced with the number 3?

- (1) a_1
 (2) n
 (3) a_n
 (4) d

19 Below are two representations of data.

A: 2, 5, 5, 6, 6, 6, 7, 8, 9 *Med* *range: 7*



Which statement about A and B is true?

- (1) median of A > median of B
 (2) range of A < range of B *7.5*
 (3) upper quartile of A < upper quartile of B *9*
 (4) lower quartile of A > lower quartile of B

20 Which system has the same solution as the system below?

$$\begin{aligned} x + 3y &= 10 \\ -2x - 2y &= 4 \end{aligned}$$

(1) $-x + y = 6$
 $2x + 6y = 20$

(3) $x + y = 6$
 $2x + 6y = 20$

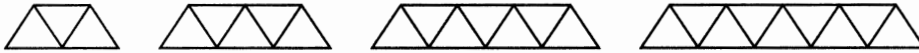
(2) $-x + y = 14$
 $2x + 6y = 20$

(4) $x + y = 14$
 $2x + 6y = 20$

$$\begin{aligned} 2x + 6y &= 20 \\ -2x - 2y &= 4 \\ \hline 4y &= 24 \\ y &= 6 \\ -2x + 2y &= 28 \\ 2x + 6y &= 20 \\ \hline 8y &= 48 \quad y = 6 \\ x + 3(6) &= 10 \\ x &= -8 \\ (-8, 6) \\ -x + 6 &= 14 \\ -x &= 8 \\ x &= -8 \end{aligned}$$

Use this space for computations.

- 21 Given the pattern below, which recursive formula represents the number of triangles in this sequence?



- (1) $y = 2x + 3$ (3) $a_1 = 2, a_n = a_{n-1} + 3$
 (2) $y = 3x + 2$ (4) $a_1 = 3, a_n = a_{n-1} + 2$

- 22 Students were asked to write an expression which had a leading coefficient of 3 and a constant term of -4 . Which response is correct?

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

- 23 Sarah travels on her bicycle at a speed of 22.7 miles per hour. What is Sarah's approximate speed, in kilometers per minute?

- (1) 0.2 (3) 36.5
 (2) 0.6 (4) 36.6

$$\frac{22.7 \text{ M}}{\text{hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1.609 \text{ km}}{1 \text{ M}} = .6$$

- 24 Which ordered pair does *not* fall on the line formed by the other three?

- (1) (16,18) (3) (9,10)
 (2) (12,12) (4) (3,6)

$$\frac{12-10}{12-9} = \frac{10-6}{9-3}$$

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 Solve algebraically for y :

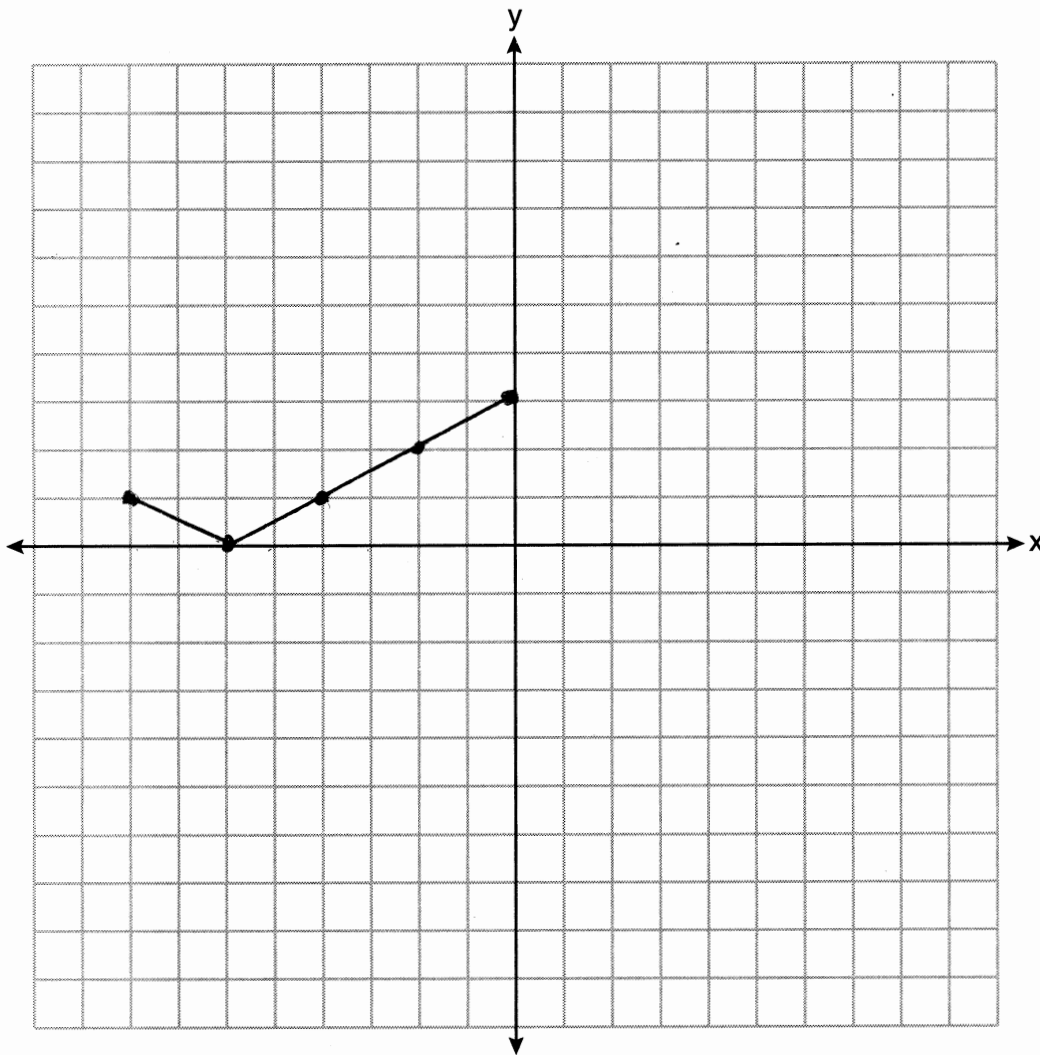
$$4(y - 3) \leq 4(2y + 1)$$

$$4y - 12 \leq 8y + 4$$

$$-16 \leq 4y$$

$$-4 \leq y$$

26 Graph the function $f(x) = \left| \frac{1}{2}x + 3 \right|$ over the interval $-8 \leq x \leq 0$.



- 27 The table below shows the height in feet, $h(t)$, of a hot-air balloon and the number of minutes, t , the balloon is in the air.

Time (min)	2	5	7	10	12
Height (ft)	64	168	222	318	369

The function $h(t) = 30.5t + 8.7$ can be used to model this data table.

Explain the meaning of the slope in the context of the problem.

The height of the balloon increases 30.5 ft. per minute.

Explain the meaning of the y -intercept in the context of the problem.

The balloon starts at the height of 8.7 ft.

28 Factor $x^4 - 16$ completely.

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

29 Mike knows that $(3, 6.5)$ and $(4, 17.55)$ are points on the graph of an exponential function, $g(x)$, and he wants to find another point on the graph of this function.

First, he subtracts 6.5 from 17.55 to get 11.05.

Next, he adds 11.05 and 17.55 to get 28.6.

He states that $(5, 28.6)$ is a point on $g(x)$.

Is he correct? Explain your reasoning.

No, He Found another point if $g(x)$ were a linear function.

- 30 Use the method of completing the square to determine the vertex of $f(x) = x^2 - 14x - 15$. State the coordinates of the vertex.

$$x^2 - 14x + 49 - 15 - 49$$

$$(x - 7)^2 - 64$$

$$(7, -64)$$

31 The temperature inside a cooling unit is measured in degrees Celsius, C . Josh wants to find out how cold it is in degrees Fahrenheit, F .

Solve the formula $C = \frac{5}{9}(F - 32)$ for F so that Josh can convert Celsius to Fahrenheit.

$$\begin{aligned} 9C &= 5F - 160 \\ \frac{9C + 160}{5} &= \frac{5F}{5} \end{aligned}$$

32 Solve $4w^2 + 12w - 44 = 0$ algebraically for w , to the nearest hundredth.

$$w^2 + 3w - 11 = 0$$

$$w = \frac{-3 \pm \sqrt{3^2 - 4(1)(-11)}}{2(1)}$$

$$w = 2.14, -5.14$$

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 Joey recorded his heart rate, in beats per minute (bpm), after doing different numbers of jumping jacks. His results are shown in the table below.

Number of Jumping Jacks x	Heart Rate (bpm) y
0	68
10	84
15	104
20	100
30	120

State the linear regression equation that estimates the heart rate per number of jumping jacks.

$$y = 1.72x + 69.4$$

State the correlation coefficient of the linear regression equation, rounded to the *nearest hundredth*.

$$r = 0.97$$

Explain what the correlation coefficient suggests in the context of this problem.

There is a strong correlation between the number of jumping jacks & heart rate.

34 Hannah went to the school store to buy supplies and spent \$16. She bought four more pencils than pens and two fewer erasers than pens. Pens cost \$1.25 each, pencils cost \$0.55 each, and erasers cost \$0.75 each.

If x represents the number of pens Hannah bought, write an equation in terms of x that can be used to find how many of each item she bought.

$$1.25x + 0.55(x+4) + 0.75(x-2) = 16$$

Use your equation to determine algebraically how many pens Hannah bought.

$$1.25x + 0.55x + 2.2 + 0.75x - 1.5 = 16$$

$$2.55x + 0.7 = 16$$

$$2.55x = 15.3$$

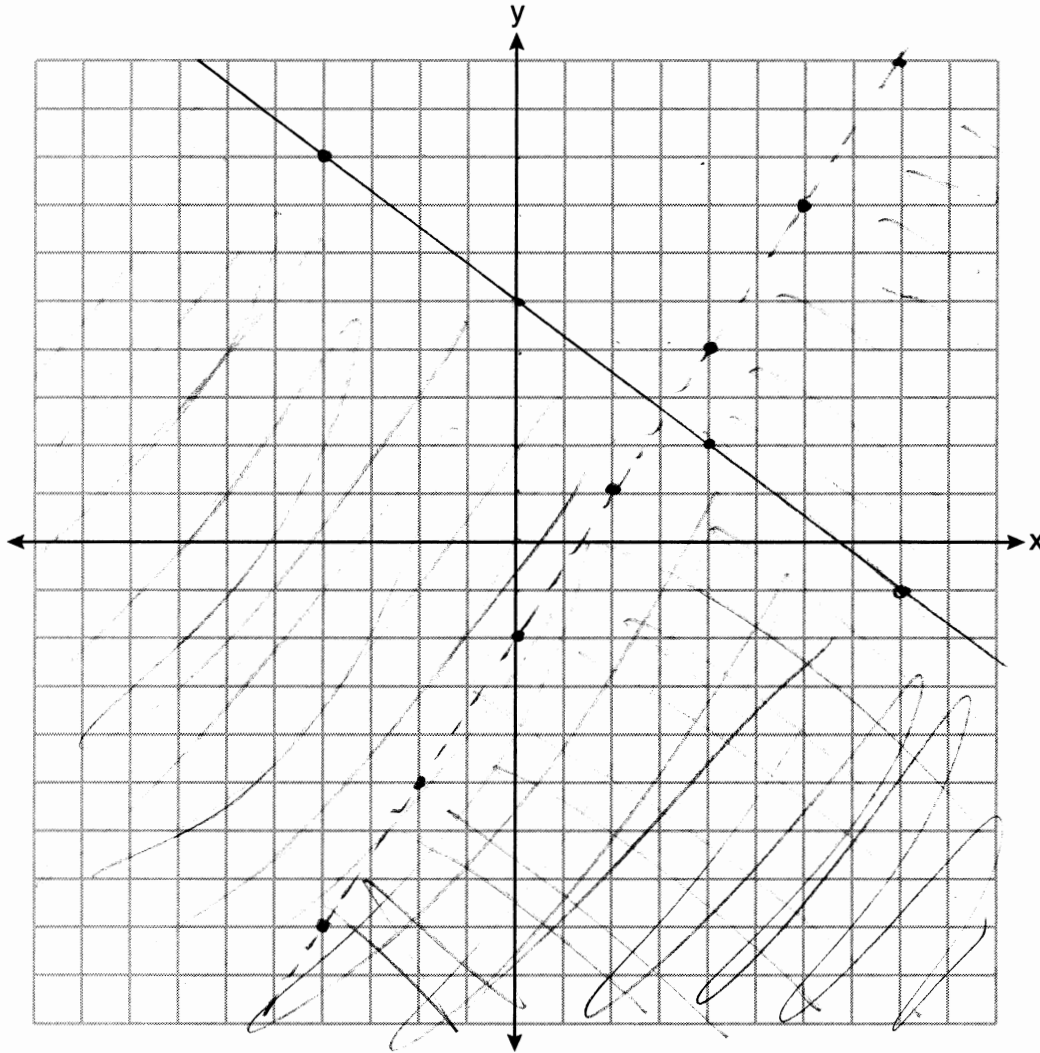
$$x = 6$$

35 Graph the system of inequalities on the set of axes below:

$$y \leq -\frac{3}{4}x + 5$$

$$3x - 2y > 4$$

$$y < \frac{3}{2}x - 2$$



Is (6,3) a solution to the system of inequalities? Explain your answer.

No. (6,3) does not lie in the solution set.

36 A ball is projected up into the air from the surface of a platform to the ground below. The height of the ball above the ground, in feet, is modeled by the function $f(t) = -16t^2 + 96t + 112$, where t is the time, in seconds, after the ball is projected.

State the height of the platform, in feet.

112

State the coordinates of the vertex. Explain what it means in the context of the problem.

(3, 256) At $t=3$, the ball is 256 Ft Feet high.

State the entire interval over which the ball's height is *decreasing*.

3-7 seconds

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 At a local garden shop, the price of plants includes sales tax.

The cost of 4 large plants and 8 medium plants is \$40. The cost of 5 large plants and 2 medium plants is \$28.

If l is the cost of a large plant and m is the cost of a medium plant, write a system of equations that models this situation.

$$\begin{aligned}4l + 8m &= 40 \\5l + 2m &= 28\end{aligned}$$

Could the cost of one large plant be \$5.50 and the cost of one medium plant be \$2.25? Justify your answer.

No

$$5(5.5) + 2(2.25) \neq 28$$

Determine algebraically both the cost of a large plant and the cost of a medium plant.

$$\begin{aligned}4l + 8m &= 40 \\20l + 8m &= 112 \\ \hline 16l &= 72 \\ l &= 4.5 \\ 4(4.5) + 8m &= 40 \\ 8m &= 22 \quad m = 2.75\end{aligned}$$