**PC 11 Homework 5.1**

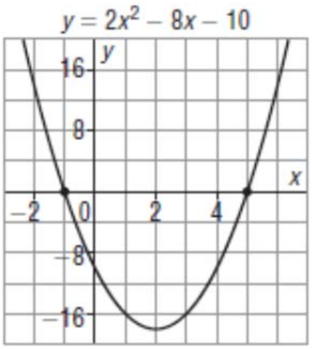
1) Use the given graphs to write the solutions of the corresponding quadratic inequalities.

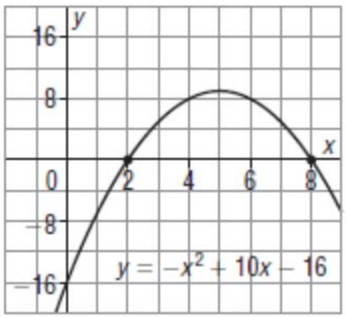
a) $2x^2 - 8x - 10 < 0$

b) $2x^2 - 8x - 10 \geq 0$

c) $-x^2 + 10x - 16 > 0$

d) $-x^2 + 10x - 16 \leq 0$




2) Solve each quadratic inequality. Represent each solution on a number line.

a) $x^2 - x - 12 \leq 0$

b) $4x^2 + 8x + 3 > 0$

c) $-2x^2 + 5x + 3 \geq 0$

3) Solve each quadratic inequality. Represent each solution on a number line.

a) $-5x^2 > 17x - 12$

b) $4x^2 + 15x > -14$

4) Use the quadratic formula to solve each quadratic inequality. Give the solutions to the nearest tenth. (Calculator is permitted)

a) $2x^2 - 3x - 4 < 0$

b) $\frac{x^2}{3} + \frac{2x}{5} > 1$

5) Solve each quadratic inequality using the method indicated

a) $3x^2 < 21x$ (Use Factoring)

b) $4x^2 - 1 > 3x + 25$ (Use Graphing Calculator state solutions to the nearest tenth)

6) The product of two consecutive even integers is at least 48. What might the integers be? Show your reasoning algebraically.

7) Create a quadratic inequality that has the following solution.

a) $-13 \leq x \leq -3$

Ans 5.1

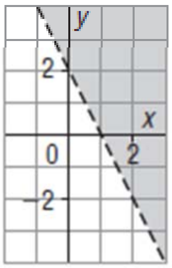
1) a) $-1<x<5$ b) $x \leq -1$ or $x \geq 5$ c) $2<x<8$ d) $x \leq 2$ or $x \geq 8$
2) a) $-3 \leq x \leq 4$ b) $x< -\frac{3}{2}$ or $x > -\frac{1}{2}$ c) $-\frac{1}{2} \leq x \leq 3$
3) a) $-4<x<\frac{3}{5}$ b) $x<-2$ or $x> -\frac{7}{4}$
4) a) $-0.9<x<2.4$ b) $x<-2.4$ or $x>1.2$
5) a) $0<x<7$ b) $x< -2.2$ or $x>3.0$
6) any two consecutive integers greater than 6 and 8 or any two consecutive integers less than -6 and -8.
7) a) $x^2 + 16x + 39 \leq 0$

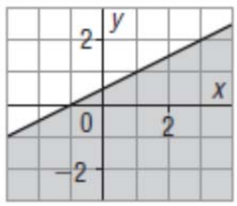
**PC 11 Homework 5.2**

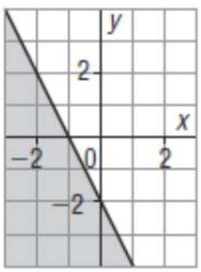
1) Match each graph with an inequality below.

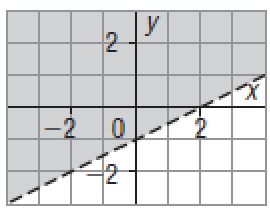
i) $2x + y \le -2$ ii) $2x + y > 2$

iii) $x - 2y < 2$ iv) $x - 2y \ge -1$

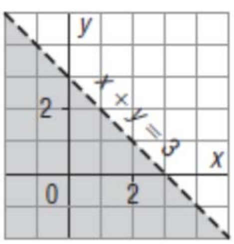
a) 

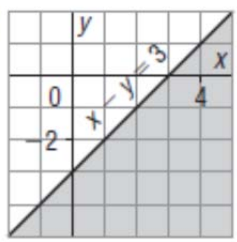

b) 


c) 


d) 


2) Write an inequality to describe each graph.

a) 


b) 


3) Graph each linear inequality.

a) $y \le 2x + 5$ b) $y > -\frac{1}{3}x + 1$

c) $y < -4x - 4$ d) $y \ge \frac{4}{3}x - 2$

4) Graph each linear inequality. Give the coordinates of 3 points that satisfy the inequality.

a) $5x + 3y > 15$ b) $3x - 2y \le -9$

c) $x + 6y \ge -4$ d) $4x - 7y < 21$

5) Nina takes her friends to an ice cream store. A milkshake costs \$3 and a chocolate sundae costs \$2.50. Nina has \$18 in her purse.

**a)** Write an inequality to describe how Nina can spend her money.

**b)** Determine 3 possible ways Nina can spend up to \$18.

**c)** What is the most money Nina can spend and still have change from \$18?

6) Graph each inequality for the given restrictions on the variables.

a) $y > -3x + 4$; for $x > 0, y > 0$

b) $2x - 3y < 6$; for $x \ge 0, y \le 0$

7) A personal trainer books clients for either 45-min or 60-min appointments. He meets with clients a maximum of 40 h each week.

**a)** Write an inequality that represents the trainer's weekly appointments.

**b)** Graph the related equation, then describe the graph of the inequality.

**c)** How many 45-min appointments are possible if no 60-min appointments are scheduled? Where is the point that represents this situation located on the graph?

**5.2 ANS**

1. a)→ ii) b)→iv) c)→i) d)→iii)

2. a) y < -x + 3 b) y ≤ x – 3

3. *See back*

4. *See back*

5. a) Let m represent the number of milkshakes and s represent the number of sundaes.

An inequality is: 3m + 2.5s ≤ 18

b) *Sketch on back*
The solution is the points, with whole-number coordinates, on and below the line. Three ways are: 4 milkshakes, 2 sundaes; 3 milkshakes, 3 sundaes; 2 milkshakes, 4 sundaes

c) The point, with whole-number coordinates, that is closest to the line has coordinates (5, 1); the cost, in dollars, is: 3(5) + 2.50(1) = 17.50
Nina can spend \$17.50 and still have change.

6) *See Back*

7) a) Let x represent the number of 45-min appointments and y represent the number of 60-min appointments.
An inequality is: 45x + 60y ≤ 2400

Divide by 15.

3x + 4y ≤ 160

b) *Sketch on back*
The solution is the points, with whole-number coordinates, on and below the line.

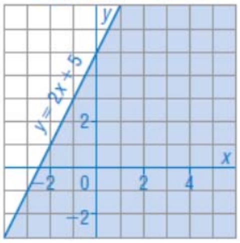
c) For no 60-min appointments, y = 0, so the point is on the x-axis; it is the point with whole-number coordinates that is closest to the x-intercept of the graph of the related equation.
When y = 0, $x = \frac{2400}{45}, or\ 53.\overline{3}$
Fifty-three 45-min appointments are possible.

5.2 Ans (Diagrams)

3.

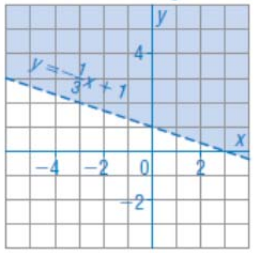
a) $y \le 2x + 5$

**Graph of $y \le 2x + 5$**



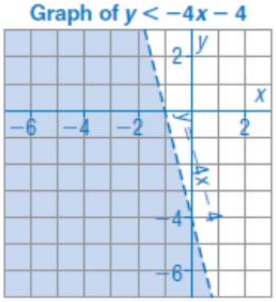

b) $y > -\frac{1}{3}x + 1$

**Graph of $y > -\frac{1}{3}x + 1$**



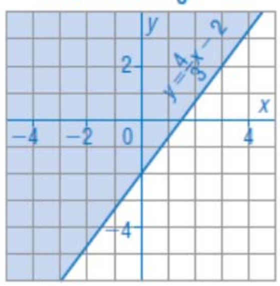

c) $y < -4x - 4$

**Graph of $y < -4x - 4$**




d) $y \ge \frac{4}{3}x - 2$

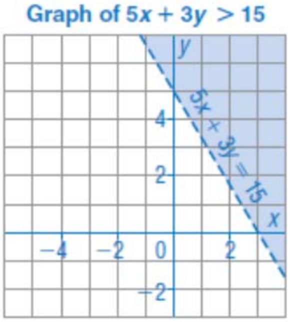
**Graph of $y \ge \frac{4}{3}x - 2$**




4.

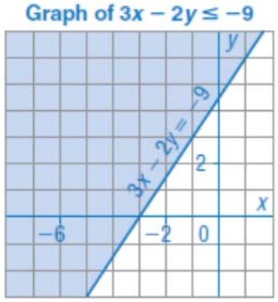
a) $5x + 3y > 15$

**Graph of $5x + 3y > 15$**



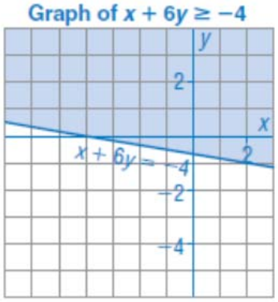

b) $3x - 2y \le -9$

**Graph of $3x - 2y \le -9$**



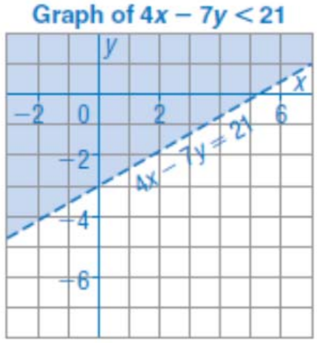

c) $x + 6y \ge -4$

**Graph of $x + 6y \ge -4$**

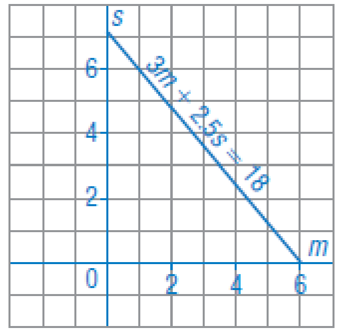



d) $4x - 7y < 21$

**Graph of $4x - 7y < 21$**

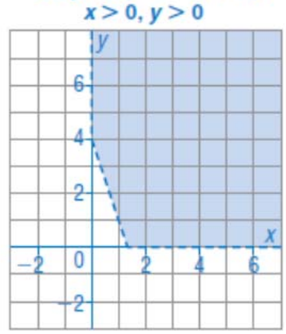



7. b)



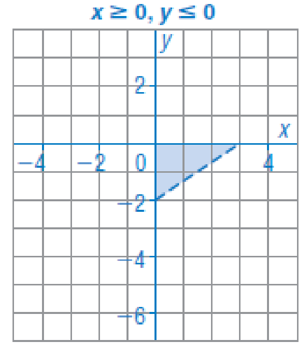

13.

**Graph of $y > -3x + 4$, $x > 0$, $y > 0$**



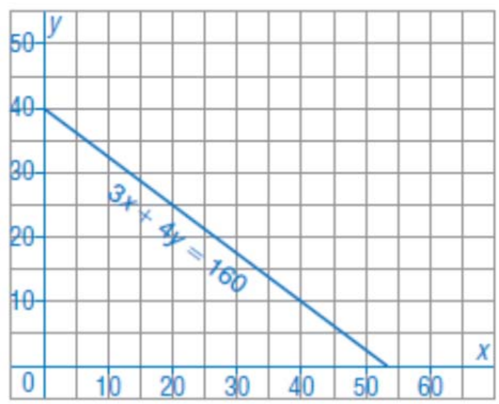
a)

**Graph of $2x - 3y < 6$, $x \ge 0$, $y \le 0$**



b)

15b)



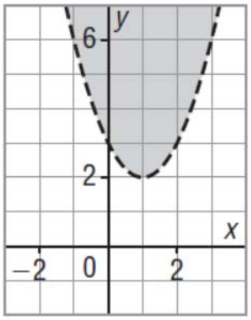
**PC 11 Homework 5.3**

1. Match each inequality with a graph below.

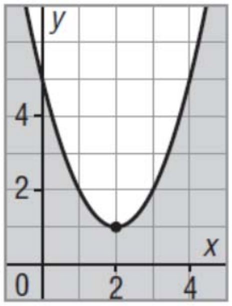
**i)** $y < (x + 1)^2 - 2$ **ii)** $y \geq (x - 2)^2 - 1$

**iii)** $y > (x - 1)^2 + 2$ **iv)** $y \leq (x - 2)^2 + 1$

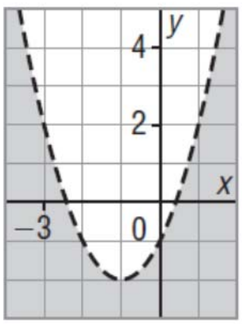
**a)**



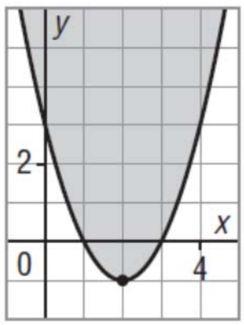

**b)**




**c)**

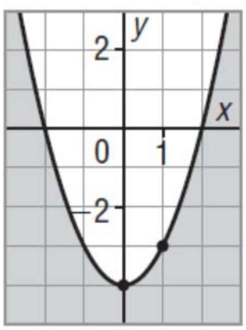



**d)**

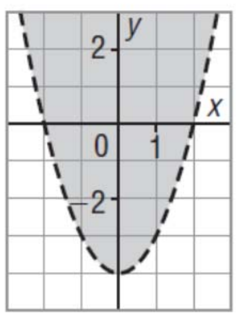



2. Write an inequality to describe each graph.

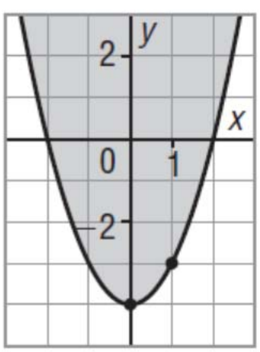
**a)**



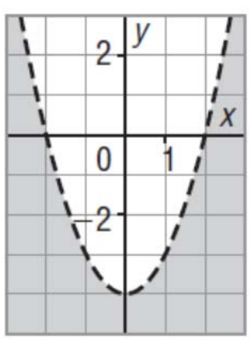

**b)**




**c)**




**d)**




3. Graph each inequality.Write the coordinates of 3 points that satisfy the inequality.

**a)** $y < -x^2 + 8$ **b)** $y \geq (x + 2)^2$

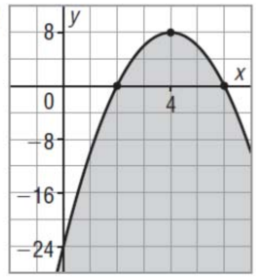
**c)** $y \leq 2(x - 1)^2 + 5$

4. Graph each inequality.Write the coordinates of 3 points that satisfy the inequality.

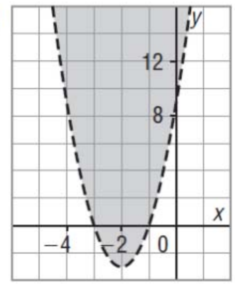
**a)** $y \leq x^2 + 6x + 10$ **b)** $y > 2x^2 - 8x + 5$

5. Write an inequality to describe each graph.

**a)**




**b)**




6.

a) For A(−1, *a*) to be a solution of $y > -2x^2 + 5$, what must be true about *a*?

For B(*b*, 6) to be a solution of $y > x^2 - 5$, what must be true about *b*?

7. Two numbers are related in this way: three times the square of one number is greater than or equal to the other number minus 4.

**a)** Graph an inequality that represents this relationship.

**b)** Use the graph to list three pairs of integer values for the two numbers.

8. The length of a rectangle is 4 times a number. The width of the rectangle is 3 less than the square of another number. The length of the rectangle is greater than its width.

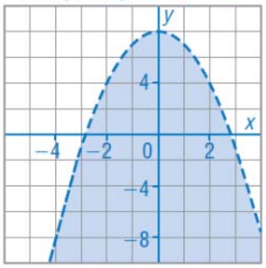
**a)** Sketch a graph to represent this situation.

**b)** Use the graph to list three possible sets of dimensions for the rectangle.

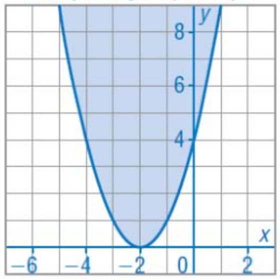
ANS 5.3

1. i)→c) ii)→d) iii)→a) iv)→b)
2. a) $y \le x^2 - 4$ b) $y > x^2 - 4$
   c) $y \ge x^2 - 4$ d) $y < x^2 - 4$
3. Any point in the shaded regions below

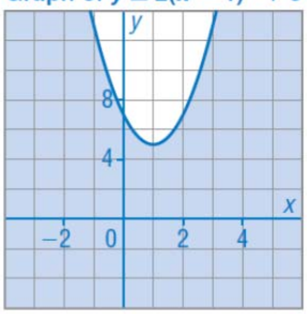
Graph of $y < -x^2 + 8$

a) 


Graph of $y \ge (x + 2)^2$

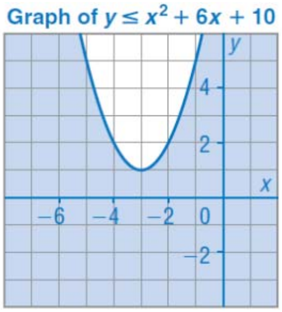
b) 


Graph of $y \le 2(x - 1)^2 + 5$

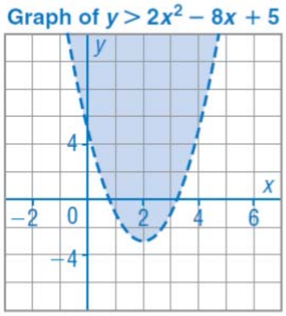
c) 


4. Graphs below

Graph of $y \le x^2 + 6x + 10$

a) 


Graph of $y > 2x^2 - 8x + 5$

b) 


Complete the square for:
$y = x^2 + 6x + 10$
$y = x^2 + 6x + 9 - 9 + 10$
$y = (x + 3)^2 + 1$

Complete the square for:
$y = 2x^2 - 8x + 5$
$y = 2(x^2 - 4x + 4 - 4) + 5$
$y = 2(x - 2)^2 - 3$

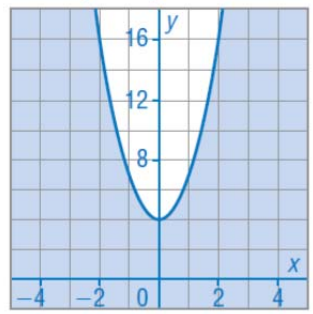
5. a) $y \le -2(x - 4)^2 + 8$
   b) $y > 3(x + 2)^2 - 3$

6. a) In $y > -2x^2 + 5$, substitute: $x = -1$, $y = a$
   $a > -2(-1)^2 + 5$
   $a > 3$

   b) In $y > x^2 - 5$, substitute: $x = b$, $y = 6$
   $6 > b^2 - 5$
   $b^2 < 11$
   $b < \sqrt{11}$ or $b > -\sqrt{11}$
   That is, $-\sqrt{11} < b < \sqrt{11}$

7. a) Let the numbers be represented by $x$ and $y$. An inequality is:
   $3x^2 \ge y - 4$, or $y \le 3x^2 + 4$
   The graph of the related function is congruent to $y = 3x^2$ and its vertex is (0, 4).
   The curve is solid, with the region below it shaded.

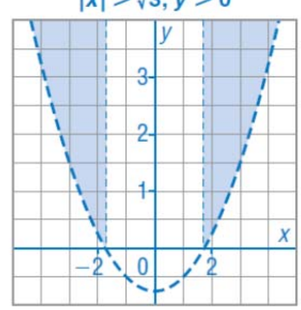
Graph of $y \le 3x^2 + 4$




   b) Three pairs of integer values are:
   (−2, 16), (−1, −2), (1, −10)

8. a)
   Let the length of the rectangle be represented by $4y$ units, and the width by $(x^2 - 3)$ units.
   The length is greater than the width so an inequality is: $4y > x^2 - 3$, or $y > 0.25x^2 - 0.75$

Graph of $y > 0.25x^2 - 0.75$, $|x| > \sqrt{3}$, $y > 0$




   b)
   Three sets of coordinates are:
   (−2, 1), (2, 2), (3, 3)
   So, three possible sets of dimensions are:
   width: $(-2)^2 - 3 = 1$; length: $4(1) = 4$
   width: $2^2 - 3 = 1$; length: $4(2) = 8$
   width: $3^2 - 3 = 6$; length: $4(3) = 12$
   Possible dimensions are: 1 unit by 4 units; 1 unit by 8 units, 6 units by 12 units

**PC 11 Homework 5.4**

1. Solve each of the following systems of equations by graphing. Name each type of system.
   a. $x + y = 0$
      $3x - 2y = 10$
   b. $y = 2 - 3x$
      $x = \frac{2}{3} - \frac{1}{3}y$
   c. $3(x + y) = 1$
      $3y = 2 - 3x$
   d. $3(x+2y) = 4(y-x)$
      $2y = 7x$

2. Verify that (-1 , 0) and (4 , 15) are solutions to the following system of equations.
   $y = 3x + 3$
   $y = x^2 - 1$
3. Solve each system of equations graphically.
   a) $y = 4x^2$
      $y = 8x$
   b) $x - 2y = 10$
      $y = x^2 + 2x - 15$
      (must estimate one point)
4. Solve each system of equations graphically.
   a) $y = -2x^2$
      $y = 2x^2 - 4$
   b) $x^2 + y - 3 = 0$
      $x^2 - y + 1 = 0$
5. Verify that $(\frac{10}{3}, \frac{17}{9})$ and (1, -2) are solutions to the following system of equations.
   $y = 2x^2 - 7x + 3$
   $y = -x^2 + 6x - 7$

**5.4 ANS**

1. a. (2, -2)   b. same line, infinite SOLN along the line y = 2 – 3x   c. same slope different line, NO SOLN   d. (0, 0)

2. Both are solutions

3. a) (0, 0) & (2, 16)   b) (-4, -7) & estimate around the point (3, -4)

4. a) (-1, -2) & (1, -2)   b) (-1, 2) & (1, 2)

5. Both are solutions

**PC 11 Homework 5.5**

1. How are the solutions of a system of equations related to the graphs of the equations ?
2. Why can a quadratic-quadratic system have infinite solutions but a linear-quadratic system cannot have infinite solutions?
3. Determine whether each ordered pair is a solution of the system of equations.

a) $y = -x^2 + 10$
$x - y = 2$
$(3, 1)$

b) $y = x^2 + 3x - 4$
$y = 2x^2 - 5x + 2$
$(2, 6)$

4. Two numbers are related:

The sum of the first number and the square of a second number is 18.
The difference between the square of the second number and twice the first number is 12.
Which system below models this relationship?

a) $(x + y)^2 = 18$
$x^2 - 2y = 12$

b) $x + y^2 = 18$
$y^2 - 2x = 12$

c) $x + 2y = 18$
$2y - x^2 = 18$

5. Solve each linear-quadratic system algebraically. Verify each solution using substitution.

a) $y = x + 4$
$y = x^2 + x$

b) $y = -x + 5$
$y = (x + 1)^2$

c) $y = 3x - 2$
$y = x^2 + 4x - 2$

6. Two numbers are related:

The first number minus 12 is equal to the second number.
The square of the first number minus 30 times the second number is equal to 360.

**a)** Create a system of equations to represent this relationship.
**b)** Solve the system to determine the numbers.

7. Solve each quadratic-quadratic system algebraically. Verify each solution using substitution.

a) $y = x^2 + 4$
$y = -x^2 + 12$

b) $y = 2(x + 4)^2$
$y = \frac{1}{2}(x + 1)^2$

c) $y = 2x^2 + 12x + 18$
$y = -(x + 3)^2 + 12$

8. Two numbers are related in this way:

The number 1 is subtracted from the first number, the difference is squared, then doubled; the result is equal to the second number.
The number 1 is added to the first number, and the sum is squared; the result is equal to 4 minus the second number.
Determine the numbers. Explain the strategy you used.

**ANS 5.5**

1. The solutions of the systems are the coordinates of the points at which the graphs intersect.
2. The solution of a system of equations are the coordinates of the points where the graphs intersect. For a system of equations to have infinite solutions, the graph of each equation must be exactly the same. It is possible for two quadratics to produce the exact same graph, but impossible for a line and quadratic to be exactly the same, therefore impossible for a linear-quadratic system to have infinite solutions.
3. a) (3, 1) is a solution. b) (2, 6) is not a solution.
4. b) is the correct choice
5. a) (-2, 2) and (2, 6)
b) (-4, 9) and (1, 4)
c) (0, -2) and (-1, -5)
6. a) Let the numbers be represented by $x$ and $y$ respectively.
A system is:
$x - 12 = y$ ①
$x^2 - 30y = 360$ ②
b) The numbers are: 0 and −12; or 30 and 18
7. a) (-2, 8) and (2, 8)
b) (-3, 2) and (-7, 18)
c) (-5, 8) and (-1, 8)
8. Let the numbers be represented by $x$ and $y$ respectively.
A system is:
$2(x - 1)^2 = y$ ①
$(x + 1)^2 = 4 - y$ ②
The numbers are: 1 and 0; or $-\frac{1}{3}$ and $\frac{32}{9}$