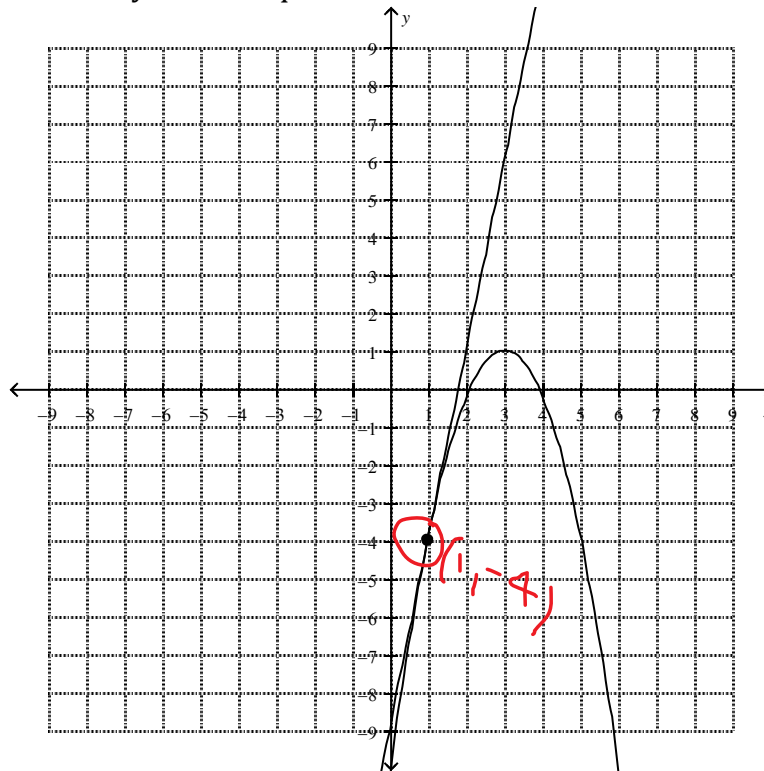


12 Part I: Multiple Choice. Write the correct answer in the space provided at the end of this section.

Formulae: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

1. What is the solution to the system of equations shown below?

- (A) (-1, -4)
- (B) (-1, 4)
- (C) (1, -4)
- (D) (1, 4)



2. How many times does a line tangent to a parabola intersect the parabola?

- (A) 0
- (B) 1
- (C) 2
- (D) 3

3. The line $y = 9x - 4$ intersects the quadratic function $y = x^2 + 7x - 3$ at one point. What are the coordinates of the point of intersection?

- (A) (-1, -5)
- (B) (-1, 5)
- (C) (1, -5)
- (D) (1, 5)

$$\begin{aligned}
 x^2 + 7x - 3 &= 9x - 4 \\
 x^2 + 7x - 9x - 3 + 4 &= 0 \\
 x^2 - 2x + 1 &= 0 \\
 (x - 1)(x - 1) & \\
 x &= 1
 \end{aligned}
 \qquad
 \begin{aligned}
 y &= 9(1) - 4 \\
 y &= 5 \\
 (1, 5) &
 \end{aligned}$$

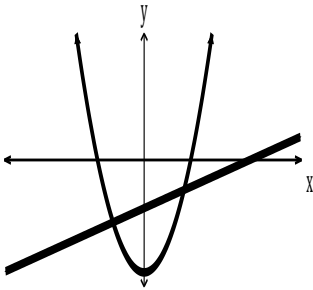
4. Which system of equations could be used to solve the given problem:

Two numbers differ by 14. When the smaller is subtracted from the square of the larger, the result is 394. What are the numbers?

- (A) $\begin{cases} x - y = 14 \\ x^2 - y = 394 \end{cases}$
- (B) $\begin{cases} x - y = 14 \\ y^2 - x = 394 \end{cases}$
- (C) $\begin{cases} x - 14 = y \\ y - x^2 = 394 \end{cases}$
- (D) $\begin{cases} x - 14 = y \\ x - y^2 = 394 \end{cases}$

$$\begin{aligned} x - y &= 14 \\ x^2 - y &= 394 \end{aligned}$$

5. What are the solutions for the system shown?



- ~~(A) (-3, 0) and (3, 0)~~
- (B) (-2, -4) and (2, -2)
- ~~(C) (0, -3) and (0, -6)~~
- ~~(D) (0, 3) and (6, 0)~~

6. The line $y = 3x$ intersects the quadratic function $y = 3x^2$ at two points. What are the coordinates of the two points of intersection?

- (A) (-1, -3) and (0, 0)
- (B) (-1, 3) and (0, 0)
- (C) (1, -3) and (0, 0)
- (D) (1, 3) and (0, 0)

$$\begin{aligned} 3x^2 &= 3x \\ 3x^2 - 3x &= 0 \\ 3x(x - 1) &= 0 \\ x = 0, x = 1 \end{aligned}$$

$$\begin{aligned} x = 0 & \Rightarrow y = 3(0) = 0 \quad (0, 0) \\ x = 1 & \Rightarrow y = 3(1) = 3 \quad (1, 3) \end{aligned}$$

7. How many solutions does the following system of equations have?

$$y = 3x - 13$$

$$y = 3x^2 - 2x - 4$$

$$D = b^2 - 4ac$$

$$= (-5)^2 - 4(3)(17)$$

$$= -83$$

- (A) 0
- (B) 1
- (C) 2
- (D) 3

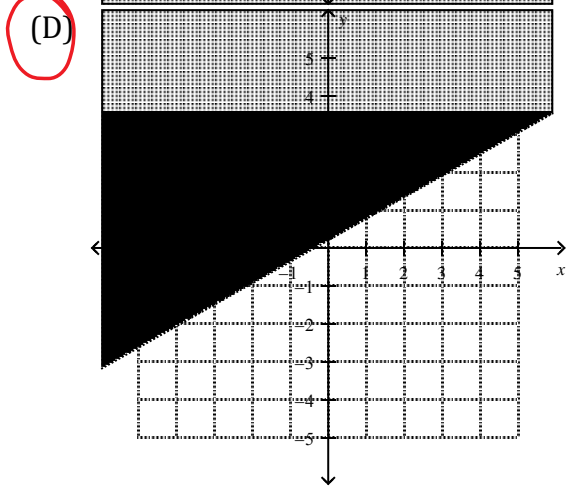
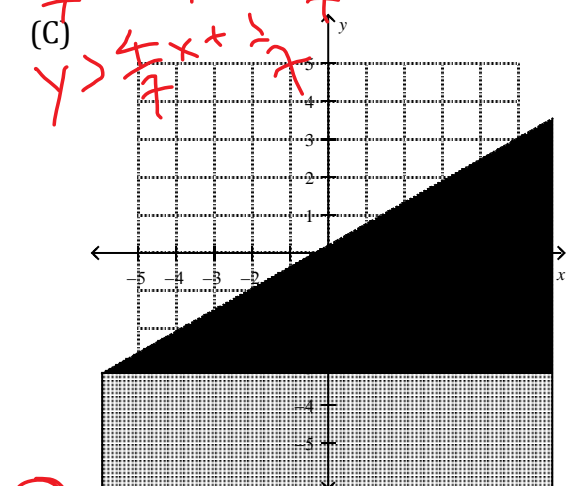
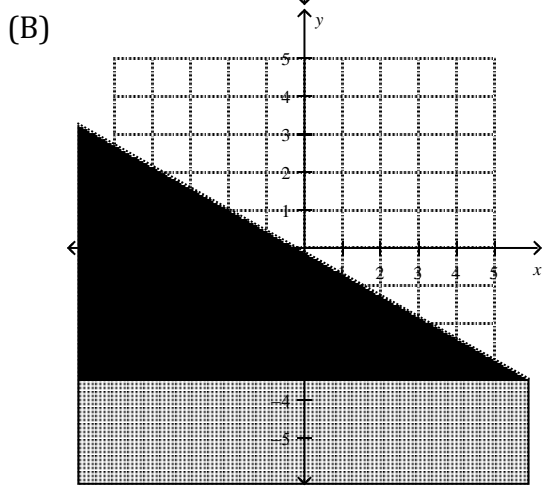
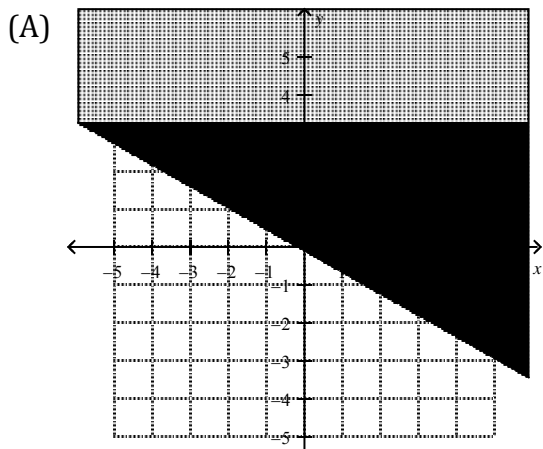
$$3x^2 - 2x - 4 = 3x - 13$$

$$3x^2 - 5x + 9 = 0$$

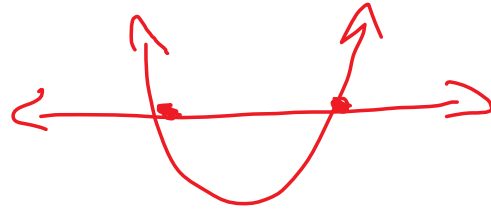
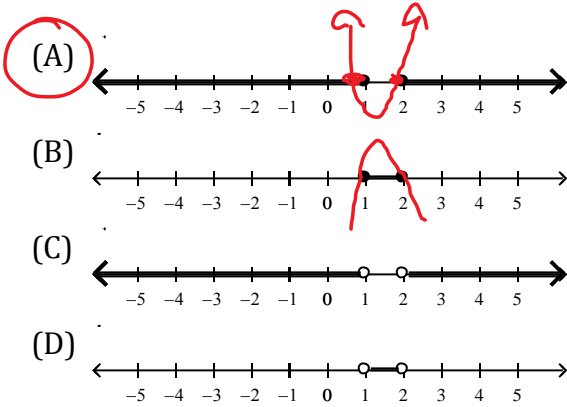
8. Which is the graph of $-4x + 7y > 1$?

$$\frac{7y - 1}{7} > \frac{4x + 1}{7}$$

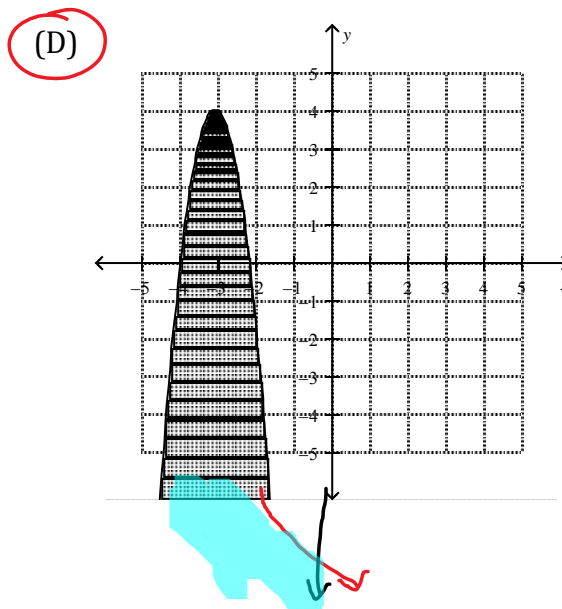
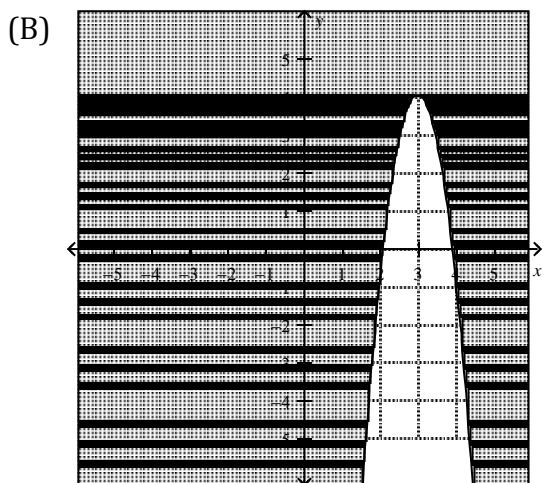
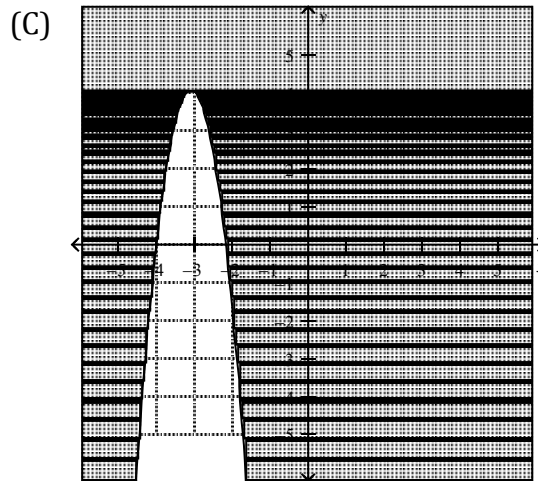
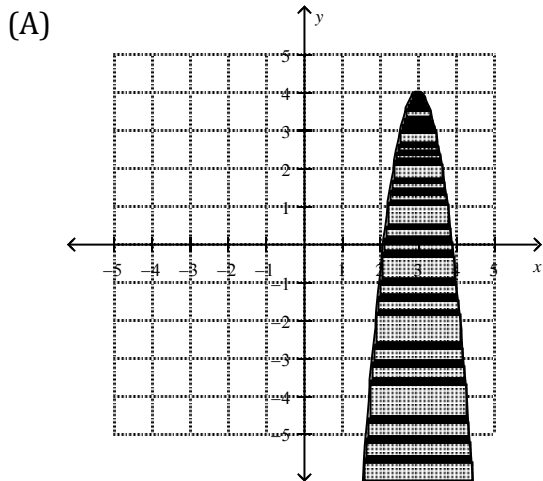
$$y > \frac{4x + 1}{7}$$



9. Which graph represents the solution to the inequality $2x^2 - 6x + 4 \geq 0$?



10. Which graph represents the solution to the inequality $y \leq -5(x + 3)^2 + 4$?



11. What is the solution set to the inequality $-2x^2 + 8x - 6 > 0$?

- (A) $\{x | 1 < x < 3, x \in R\}$
- (B) $\{x | -3 < x < -1, x \in R\}$
- (C) $\{x | x < 1, x > 3, x \in R\}$
- (D) $\{x | x < -3, x > -1, x \in R\}$

-2

$$x^2 - 4x + 3 < 0$$

① $0^2 - 4(0) + 3 < 0$
 $3 < 0$ ✗

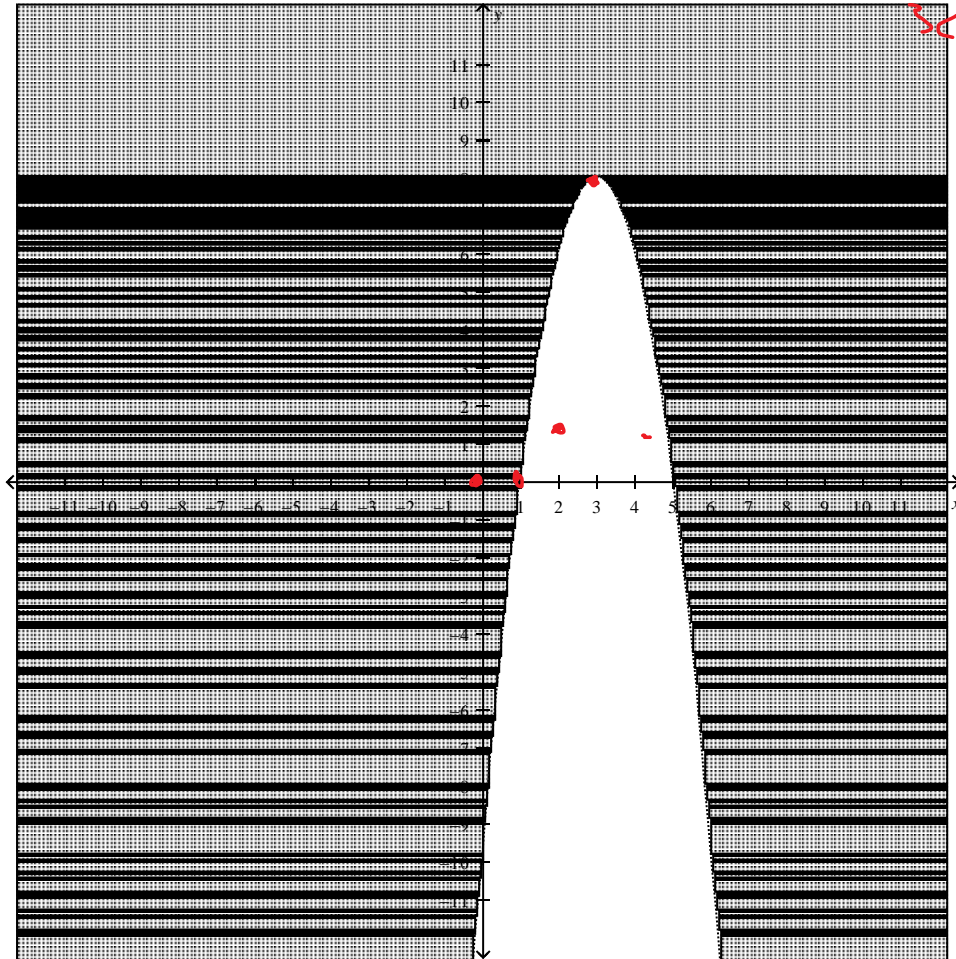
② $2^2 - 4(2) + 3 < 0$
 $-5 < 0$ ✓

③ $4^2 - 4(3) + 3 < 0$
 $5 < 0$ ✗

$x = 3, x = 1$

12. Which point satisfies the inequality $y > -2(x - 3)^2 + 8$?

- (A) (0, 1)
- (B) (1, 0)
- (C) (2, 1)
- (D) (3, 8)



Answers to multiple choice.

1. ___ 2. ___ 3. ___ 4. ___ 5. ___ 6. ___
7. ___ 8. ___ 9. ___ 10. ___ 11. ___ 12. ___

21 Part II: **Constructed Response.** Answer each question in the space provided. Show all workings.

4 13. Algebraically determine the solution of the following system of equations:

$$\begin{aligned} 3x - y - 5 &= 0 \\ -4x &= y + 2x^2 + 1 \end{aligned}$$

$$3x - 5 = -2x^2 - 4x - 1$$

$$\textcircled{1} 3x - 5 = y$$

$$\textcircled{2} -2x^2 - 4x - 1 = y$$

$$2x^2 + 3x + 4x - 5 + 1 = 0$$

$$2x^2 + 7x - 4 = 0$$

$$2x^2 + 8x - x - 4 = 0$$

$$2x(x+4) - (x+4) = 0$$

$$(x+4)(2x-1) = 0$$

$$x = -4, x = \frac{1}{2}$$

$$x = -4$$

$$y = 3(-4) - 5$$

$$y = -17$$

$$(-4, -17)$$

$$x = \frac{1}{2}$$

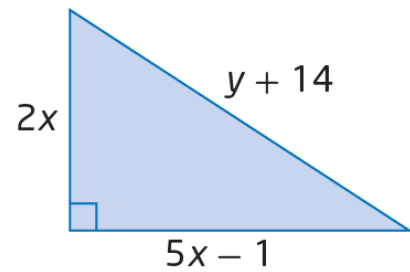
$$y = 3\left(\frac{1}{2}\right) - 5$$

$$y = \frac{3}{2} - \frac{10}{2}$$

$$y = -\frac{7}{2}$$

$$\left(\frac{1}{2}, -\frac{7}{2}\right)$$

- 4 14. The perimeter of the right triangle shown below is 60 m. The area of the triangle is 10y square metres. What are the dimensions of the triangle?



$$2x + 5x - 1 + y + 14 = 60$$

$$7x + y + 13 = 60$$

$$\textcircled{1} 7x + y = 47$$

$$\frac{1}{2}(2x)(5x - 1) = 10y$$

$$\textcircled{2} 5x^2 - x = 10y$$

$$y = -7x + 47$$

$$5x^2 - x = 10(-7x + 47)$$

$$5x^2 - x = -70x + 470$$

$$5x^2 + 69x - 470 = 0$$

$$x = \frac{-69 \pm \sqrt{69^2 - 4(5)(-470)}}{2(5)}$$

$$x = \frac{-69 \pm \sqrt{4161}}{10}$$

$$x = \frac{-69 \pm 119}{10}$$

$$x = \frac{-69 + 119}{10}$$

$$x = \frac{50}{10}$$

$$\boxed{x = 5}$$

$$x = \frac{-69 - 119}{10}$$

$$\cancel{x = 18.8}$$

$$y = -7(5) + 47$$

$$y = 12$$

$$H = 2(5) = 10\text{m}$$

$$B = 5(5) - 1 = 24\text{m}$$

$$\text{HYP} = 12 + 14 = 26\text{m}$$

- 4 15. A parachutist jumps from an airplane and immediately opens his parachute. His altitude, y , in metres, after t seconds is modelled by the equation $y = -4t + 300$. A second parachutist jumps 5 s later and free-falls for a few seconds. Her altitude, in metres, during this time, is modelled by the equation $y = -5(t - 5)^2 + 300$. When does she reach the same altitude as the first parachutist?

$$y = -5(t^2 - 10t + 25) + 300$$

$$y = -5t^2 + 50t - 125 + 300$$

$$y = -5t^2 + 50t + 175$$

$$-4t + 300 = -5t^2 + 50t + 175$$

$$5t^2 - 4t - 50t + 300 - 175 = 0$$

$$5t^2 - 54t + 125 = 0$$

$$t = \frac{-(-54) \pm \sqrt{(-54)^2 - 4(5)(125)}}{2(5)}$$

$$t = \frac{54 \pm \sqrt{116}}{10}$$

$$t = \frac{54 \pm 20.4}{10}$$

$$t = \frac{54 - 20.4}{10}$$

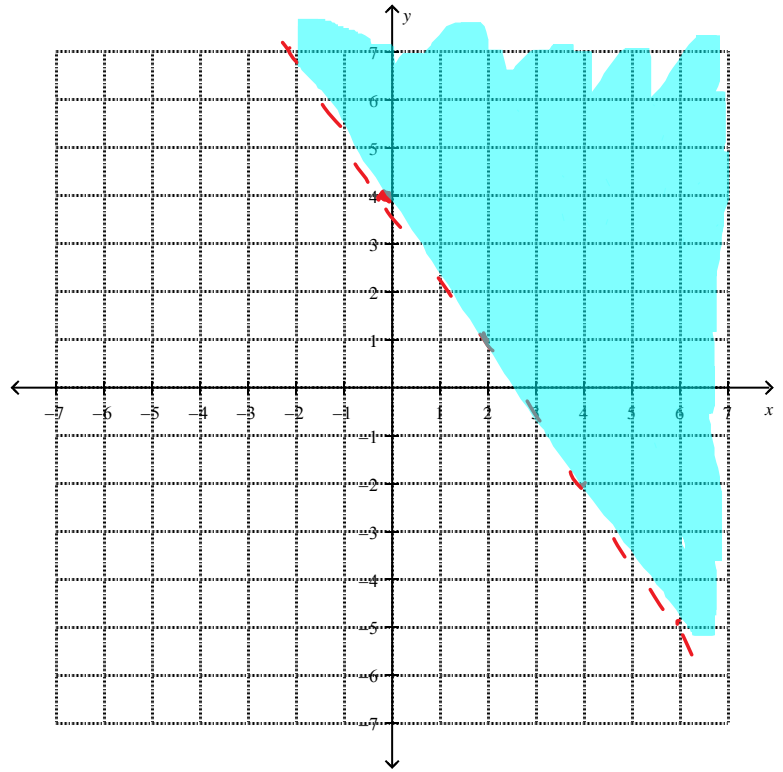
~~$$t = 3.36$$~~

$$t = \frac{54 + 20.4}{10}$$

$$t = 7.4 \text{ s}$$

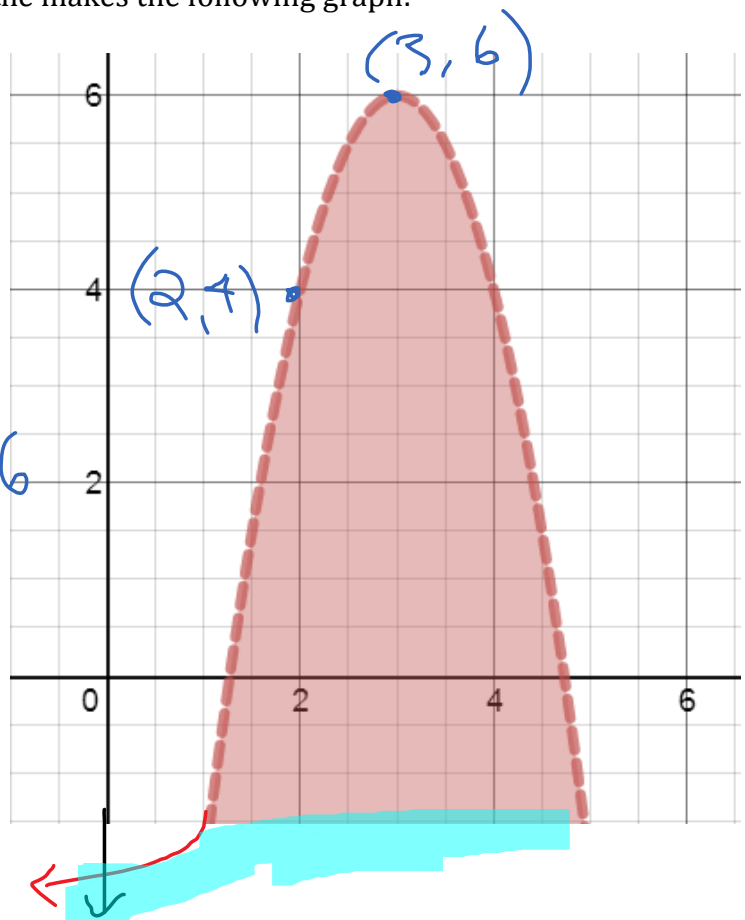
3 16. Graph the inequality $3x + 2y > 8$

$$\frac{2y}{2} > \frac{-3x + 8}{2}$$
$$y > -\frac{3}{2}x + 4$$



3 17. Algebraically determine the inequality that makes the following graph:

$$y = a(x-p)^2 + q$$
$$4 = a(2-3)^2 + 6$$
$$4 - 6 = a$$
$$-2 = a$$
$$y < -2(x-3)^2 + 6$$



- 3 18. A square storage area measures 10 m on a side. By how much must each side be shortened to decrease this area to less than half the original area?

$$(10-x)(10-x) < 50$$

$$100 - 20x + x^2 < 50$$

$$x^2 - 20x + 50 < 0$$

$$x = \frac{-(-20) \pm \sqrt{(-20)^2 - 4(1)(50)}}{2(1)}$$

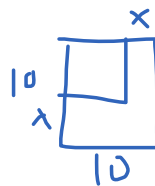
$$x < \frac{20 \pm \sqrt{400 - 200}}{2}$$

$$x < \frac{20 \pm 14.1}{2}$$

$$x < \frac{20 + 14.1}{2}$$

$$x < \frac{20 + 14.1}{2}$$

~~$$x < 17.05$$~~



$$A = 10^2 = 100$$

$$\frac{1}{2}(100) = 50$$

$$x < \frac{20 - 14.1}{2}$$

$$x < 3.00$$