

Unit 7B Review for the Test

Read each situation. Then answer the questions about each situation. Show work!

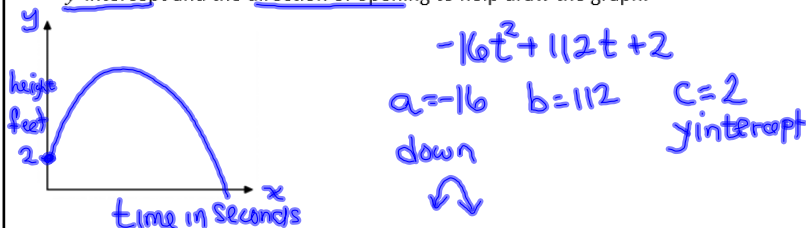
1. A firework is launched straight up into the air from a platform. Its altitude is modeled by  $h(t) = -16t^2 + 112t + 2$  where  $t$  is the time in seconds and  $h(t)$  is the height of the firework in feet.

a. Define your variables.

$x = t =$  time in seconds

$y = h(t) =$  height in feet

b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.



c. How high is the firework after 2 seconds? Show your work.

Replace  $t$  with 2  $t=2$   
 $-16t^2 + 112t + 2$   
 $-16(2)^2 + 112(2) + 2 = \boxed{162 \text{ ft}}$

d. What is the maximum height of the firework? Show your work.

vertex  
 $\frac{-b}{2a} = \frac{-112}{2(-16)} = \frac{-112}{-32} = 3.5 \text{ sec}$   
 replace  $t$  with 3.5  
 $-16t^2 + 112t + 2$   
 $-16(3.5)^2 + 112(3.5) + 2 = \boxed{198 \text{ ft}}$

e. How long does it take for the firework to return to the ground? Round to the nearest hundredth. Show your work. (Hint: Use quadratic formula.)

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 $t = \frac{-112 \pm \sqrt{(112)^2 - 4(-16)(2)}}{2(-16)}$   
 $\frac{-112 \pm \sqrt{12672}}{-32}$   
 $\frac{-112 \pm 112.57}{-32}$   
 $\frac{-112 + 112.57}{-32} = \cancel{0.01}$   
 $\frac{-112 - 112.57}{-32} = \boxed{7.01 \text{ seconds}}$

*can't have negative seconds*

Solve each inequality. Write your answer in interval notation. Draw a rough sketch of a graph for each problem. Show your work.

*like #2  
Symbol different*

2.  $(x-9)(x+8) \leq 0$

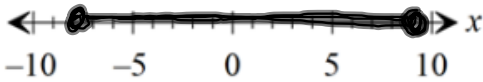
below  
zeros

$$\begin{array}{r} x-9=0 \\ x-9+9 \\ x=9 \end{array}$$

$$\begin{array}{r} x+8=0 \\ -8-8 \\ \hline x=-8 \end{array}$$

$$x=9$$

$$x=-8$$



$$[-8, 9]$$

*like #3  
Symbol different*

3.  $x^2 - 7x > 0$

above

$$x(x-7)$$

$$x=0$$

$$\begin{array}{r} x-7=0 \\ +7+7 \\ x=7 \end{array}$$



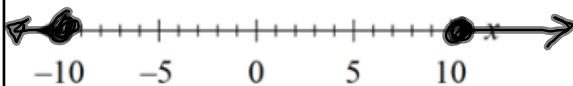
$$(-\infty, 0) \cup (7, \infty)$$

4.  $x^2 - 100 \geq 0$  above, zeros

$(x-10)(x+10)$

$$\begin{array}{r} x-10=0 \\ +10 \quad 10 \\ \hline x=10 \end{array}$$

$$\begin{array}{r} x+10=0 \\ -10 \quad -10 \\ \hline x=-10 \end{array}$$



$(-\infty, -10] \cup [10, \infty)$

5.  $x^2 + 8x + 7 < 0$

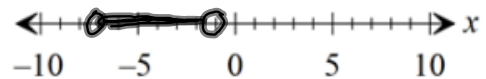
$\frac{7}{8}$

$(x+1)(x+7)$

below

$$\begin{array}{r} x+1=0 \\ -1 \quad -1 \\ \hline x=-1 \end{array}$$

$$\begin{array}{r} x+7=0 \\ -7 \quad -7 \\ \hline x=-7 \end{array}$$



$(-7, -1)$

6.  $x^2 - 14x \geq -24$  above

$x^2 - 14x + 24 \geq 0$

$(x-2)(x-12)$

$x-2=0$        $x-12=0$   
 $+2 +2$        $+12 +12$   
 $x=2$        $x=12$

zeros

$$\begin{array}{r|l} 24 & -14 \\ \hline 1 & 24 \\ -2 & -12 \\ 3 & 8 \\ 4 & 6 \end{array}$$

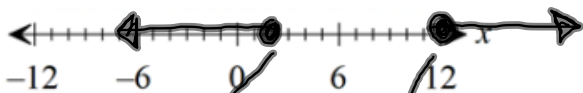
$$\begin{array}{r|l} -27 & -6 \\ \hline 1 & 27 \\ 3 & -9 \end{array}$$

7.  $x^2 - 27 < 6x$  below

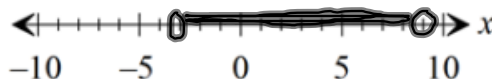
$x^2 - 6x - 27 < 0$

$(x+3)(x-9)$

$x+3=0$        $x-9=0$   
 $-3 -3$        $+9 +9$   
 $x=-3$        $x=9$



$(-\infty, 2] \cup [12, \infty)$



$(-3, 9)$

Write a quadratic function for each parabola using the given information. Use the appropriate formula for the given information. Show your work.

8. Vertex:  $(4, 3)$ ; passes through  $(2, 5)$

$$y = a(x-h)^2 + k$$

$$y = a(x-4)^2 + 3$$

$$5 = a(2-4)^2 + 3$$

$$5 = a \cdot 4 + 3$$

$$2 = 4a$$

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

$$y = \frac{1}{2}(x-4)^2 + 3$$

9. Roots:  $(-1, 0)$  &  $(3, 0)$ ; passes through  $(4, -15)$

$$y = a(x-p)(x-q)$$

$$y = a(x-(-1))(x-3)$$

$$-15 = a(4-(-1))(4-3)$$

$$-15 = 5a$$

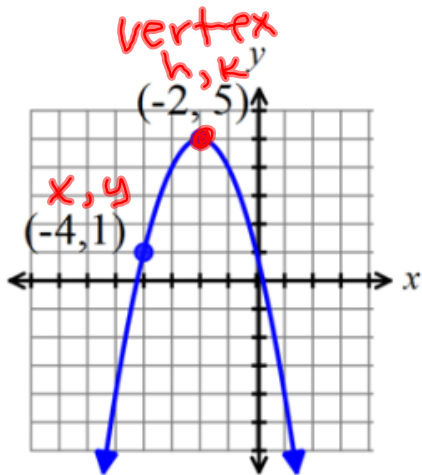
$$\frac{-15}{5} = \frac{5a}{5}$$

$$-3 = a$$

$$y = -3(x-(-1))(x-3)$$

$$y = -3(x+1)(x-3)$$

10.



vertex

$$y = a(x-h)^2 + k$$

$$y = a(x - -2)^2 + 5$$

$$1 = a(-4 - -2)^2 + 5$$

$$1 = a(4) + 5$$

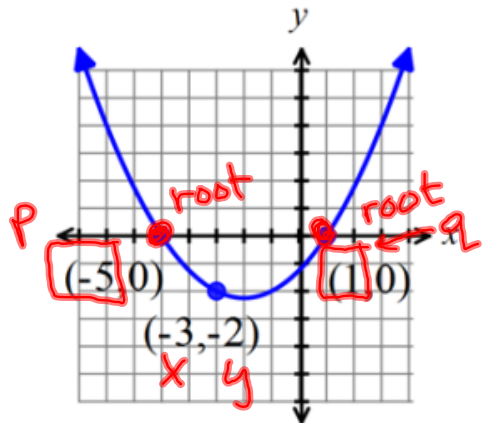
$$\frac{-4}{4} = \frac{4a}{4}$$

$$-1 = a$$

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

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

11.



roots

$$y = a(x-p)(x-q)$$

$$y = a(x - -5)(x - 1)$$

$$-2 = a(-3 - -5)(-3 - 1)$$

$$\frac{-2}{-8} = \frac{-8a}{-8}$$

$$.25 = a$$

$$y = .25(x - -5)(x - 1)$$