

Your Name

Mrs. Theo

2/10/21

Notes

2.4

Writing Vertex Form

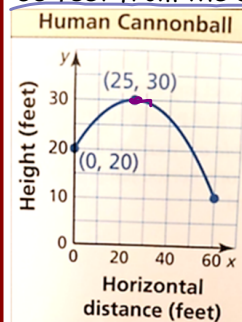
Quadratic Equations to
Model Life situations

Given the
vertex and
a point

Use vertex form, plug in both points, and
solve for a .

Rewrite, quadratic equation with the
vertex and the a you found.

ex. A performer is shot out of a cannon, where y is the height in feet and x is the horizontal distance traveled in feet. Write an equation of the parabola, if the performer reaches a max height of 30 feet in the air after flying 25 feet out, and lands in a net 55 feet from the cannon.



goal: $f(x) = a(x-h)^2 + k$

Vertex: $(25, 30)$
 h k

Point (x, y)
 $(x, f(x))$
 $(0, 20)$

$$20 = a(0-25)^2 + 30$$

$$20 = 625a + 30$$

$$-30 \quad -30$$

$$-10 = 625a$$


$$\frac{-10}{625} = \frac{625a}{625}$$

$$a = -0.016$$

$$f(x) = -0.016(x-25)^2 + 30$$

What should be the height of the net to the nearest foot?

net is 55 ft away $f(55) = -0.016(55-25)^2 + 30$
 $x = 55$ height? $f(55) = -0.016(30)^2 + 300$
 $(55, f(55))$ $y = ? = f(55)$ $f(55) = 15.6$
 x y



if the net is 55 ft away, the net needs to be 15.6 ft tall.

If a net is 11 feet tall, how far away should the net be placed?

$f(x) = 11$ ft high $11 = -0.016(x-25)^2 + 30$
 $x = ?$ -30 -30
 $-19 = -0.016(x-25)^2$
 $\frac{-0.016}{-0.016} \frac{-0.016}{-0.016}$
 $\sqrt{1187.5} = \sqrt{(x-25)^2}$
 $\pm 34.460 = x - 25$
 $x - 25 = 34.460$ $x - 25 = -34.460$
 $+25$ $+25$ $x = -9$
 horizontal distance $x = 59.460$

it should be placed 59.460 ft away if net was 11 ft high

ex. passes through $(4, 35)$ and has vertex $(-3, 14)$

Goal: $y = a(x-h)^2 + k$ formula has a minus in it

Sub in what was given $35 = a(4-(-3))^2 + 14$ $f(5) = \frac{3}{7}(5+3)^2 + 14$
 $35 = a(7)^2 + 14$ $f(5) = 41.429$

Solve 2 step equation for 'a' $35 = 49a + 14$
 -14 -14
 $\frac{21}{49} = \frac{49a}{49}$
 $\frac{3}{7} = a$ $y = \frac{3}{7}(x-(-3))^2 + 14$
 $y = \frac{3}{7}(x+3)^2 + 14$

What is $f(5)$?

What is x if $f(x)$ is -10 ?

What is x if $f(x)$ is 100?

$100 = \frac{3}{7}(x+3)^2 + 14$
 $86 = \frac{3}{7}(x+3)^2$
 $200.667 = (x+3)^2$
 $\pm\sqrt{200.667} = x+3$
 $x+3 = 14.166$ $x+3 = -14.166$
 $x = 11.166$

$-10 = \frac{3}{7}(x+3)^2 + 14$
 $-24 = \frac{3}{7}(x+3)^2$
 $-56 = (x+3)^2$
 $\pm\sqrt{-56} = x+3$
 Imaginary

ex. passes through $(0, -20)$ and has vertex $(-5, 12)$

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

$$-20 = a(0 - (-5))^2 + 12$$

$$-20 = a(5)^2 + 12$$

$$-20 = 25a + 12$$

$$\begin{array}{r} -12 \\ -12 \end{array}$$

$$-32 = 25a$$

$$\begin{array}{r} 25 \\ 25 \end{array}$$

$$a = \frac{-32}{25} = -1.28$$

$$y = -1.28(x + 5)^2 + 12$$

What is $f(-3)$?

$$f(-3) = -1.28(-3 + 5)^2 + 12$$

$$f(-3) = 6.88$$

What is x if

$f(x)$ is -10 ?

$$-10 = -1.28(x + 5)^2 + 12$$

$$-12 \quad -12$$

$$-22 = -1.28(x + 5)^2$$

$$\frac{-1.28}{-1.28} \quad \frac{-1.28}{-1.28}$$

$$17.188 = (x + 5)^2$$

$$\pm\sqrt{17.188} = x + 5$$

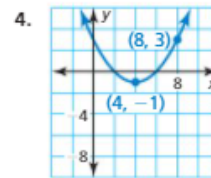
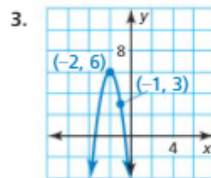
$$\begin{array}{l} x + 5 = 4.146 \quad x + 5 = -4.146 \\ -5 \quad -5 \quad \quad -5 \quad -5 \end{array}$$

$$x = -1.146 \quad x = -9.146$$

Homework:

Complete pg. 80
#3-6 and #17, 18, 20

In Exercises 3-8, write an equation of the parabola in vertex form. (See Example 1.)

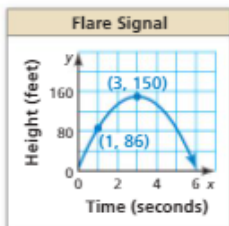


5. passes through $(13, 8)$ and has vertex $(3, 2)$

6. passes through $(-7, -15)$ and has vertex $(-5, 9)$

In Exercises 17-20, write an equation of the parabola in vertex form or intercept form.

17. 18.

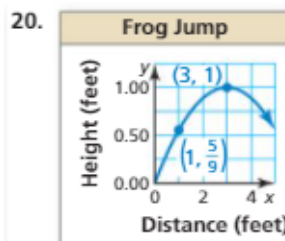


Interpret $f(2)$.

What is x if $f(x)$ is 20?

Interpret $f(3)$.

How long does it take the ride to reach the ground?



Interpret $f(4)$.

If a rock is 0.25ft high, how far back will the frog need to jump from to make it up onto the rock?

Homework Key:

Complete #3-6 , #17 and 18, #20

3. $y = -3(x + 2)^2 + 6$

4. $y = 0.25(x - 4)^2 - 1$

5. $y = 0.06(x - 3)^2 + 2$

6. $y = -6(x + 5)^2 + 9$

17. $y = -16(x - 3)^2 + 150$

18. $y = -16x^2 + 180$

19. $y = -0.75x(x - 4)$

20. $y = -\frac{1}{9}(x - 3)^2 + 1$

Interpret f(2).

What is x if f(x) is 20?

$f(2) = 134$

after 2 seconds the flare signal reaches a height of 134 ft

$x = 5.850$

$x = 0.150$

The flare signal is 20 ft in the air after 0.150 seconds on the way up and again on the way back down at 5.850 seconds.

Interpret f(3).

How long does it take the ride to reach the ground?

$f(3) = 36$

After 3 seconds the ride is 36 feet from the ground.

$x = 3.35$ seconds

It takes 3.35 seconds for the ride to reach the ground.

Interpret f(4).

If a rock is 0.25ft high, how far back will the frog need to jump from to make it up onto the rock?

$f(4) = 0.889$

When a frog jumps, 4 feet from where it started it would reach a height of 0.889 ft.

$x = 5.850$

$x = 0.150$

The frog needs to jump from either 0.150 ft or 5.850 feet away to make the jump to a rock that is 0.25 ft high.