

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Consider the quadratic function

$$y = \frac{-1}{2}x^2 + 6x - 10.$$

$$\begin{matrix} 1 & 20 \\ 2 & 10 \\ 4 & 5 \end{matrix}$$

Find the  $y$  – intercept, then factor to find the  $x$  – intercept(s). Graph the function either by using these coordinates, or by completing the table of values.

|     |  |  |  |  |  |  |  |
|-----|--|--|--|--|--|--|--|
| $x$ |  |  |  |  |  |  |  |
| $y$ |  |  |  |  |  |  |  |

$$* y = -\frac{1}{2}(x^2 - 12x + 20)$$

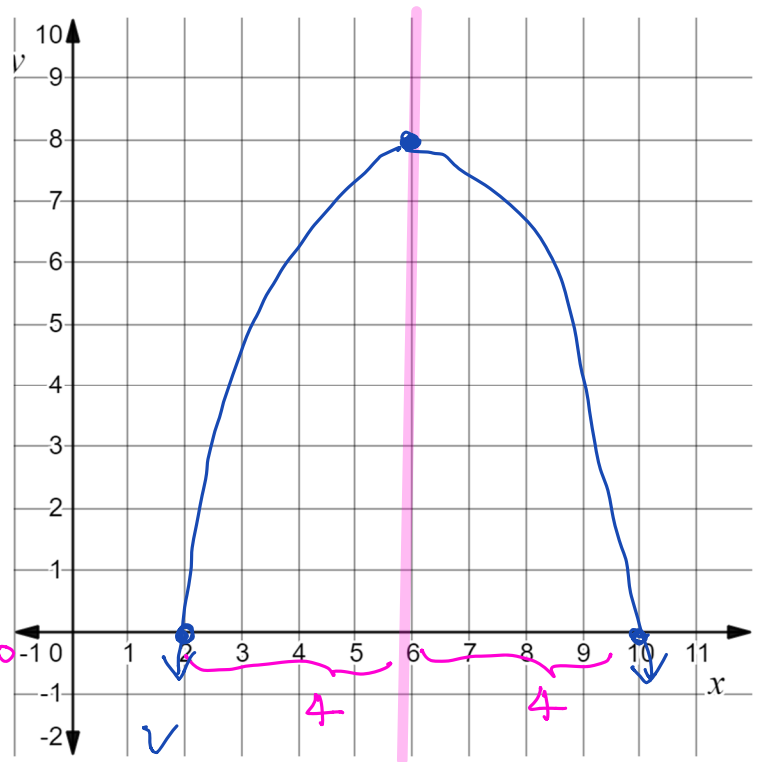
$$\begin{aligned} -2 \times -10 &= 20 \\ -2 + -10 &= -12 \end{aligned}$$

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

$$0 = -\frac{1}{2}(x-2)(x-10)$$

$$\begin{aligned} \downarrow \\ x-2 &= 0 \\ +2 \quad +2 \\ x &= 2 \end{aligned}$$

$$\begin{aligned} \downarrow \\ x-10 &= 0 \\ +10 \quad +10 \\ x &= 10 \end{aligned}$$



|  |   |   |
|--|---|---|
| <p>1. <math>y</math>-intercept <i>before you factor</i></p> <p>or <math>y = -10</math></p> <p><math>(0, -10)</math></p>                                      | <p>2. <math>x</math>-intercept(s)</p> <p><math>x = 2, 10</math></p> <p><math>(2, 0)</math> and <math>(10, 0)</math></p> | <p>3. Equation of the axis of symmetry</p> <p><math>x = 6</math></p>  |
| <p>4. Coordinates of the vertex</p> <p><math>y = -\frac{1}{2}(6-2)(6-10)</math></p> <p><math>= -\frac{1}{2}(4)(-4) = 8</math></p> <p><math>(6, 8)</math></p> | <p>5. <i>Maximum</i> or minimum? Value?</p> <p><math>y = 8</math></p>   | <p>6. Domain and range</p> <p>Domain: <math>x \in \mathbb{R}</math></p> <p>Range: <math>y \leq 8</math></p> |

Sketch a graph of each of the following functions. Find the equation of the axis of symmetry and the coordinates of the vertex. Is the vertex a maximum or minimum?

1 8  
2 4

a.

$$f(x) = 3x^2 + 6x + 24$$

b.

$$h(x) = \frac{1}{3}x^2 + 3x + 6$$

$$\frac{-4}{2} \times \frac{+2}{2} = -8$$

$$\frac{-4}{2} + \frac{+2}{2} = -2$$

$$\begin{aligned} f(1) &= -3(1-4)(1+2) \\ &= -3(-3)(3) \\ &= 27 \end{aligned}$$

(1, 27)

$$\begin{aligned} f(x) &= -3(x^2 - 2x - 8) \\ &= -3(x-4)(x+2) \end{aligned}$$

$$x = 4$$

$$x = -2$$

$$= \frac{1}{3}(x^2 + 9x + 18)$$

$$= \frac{1}{3}(x+3)(x+6)$$

$$x = -3$$

$$x = -6$$

$$x = -4.5$$

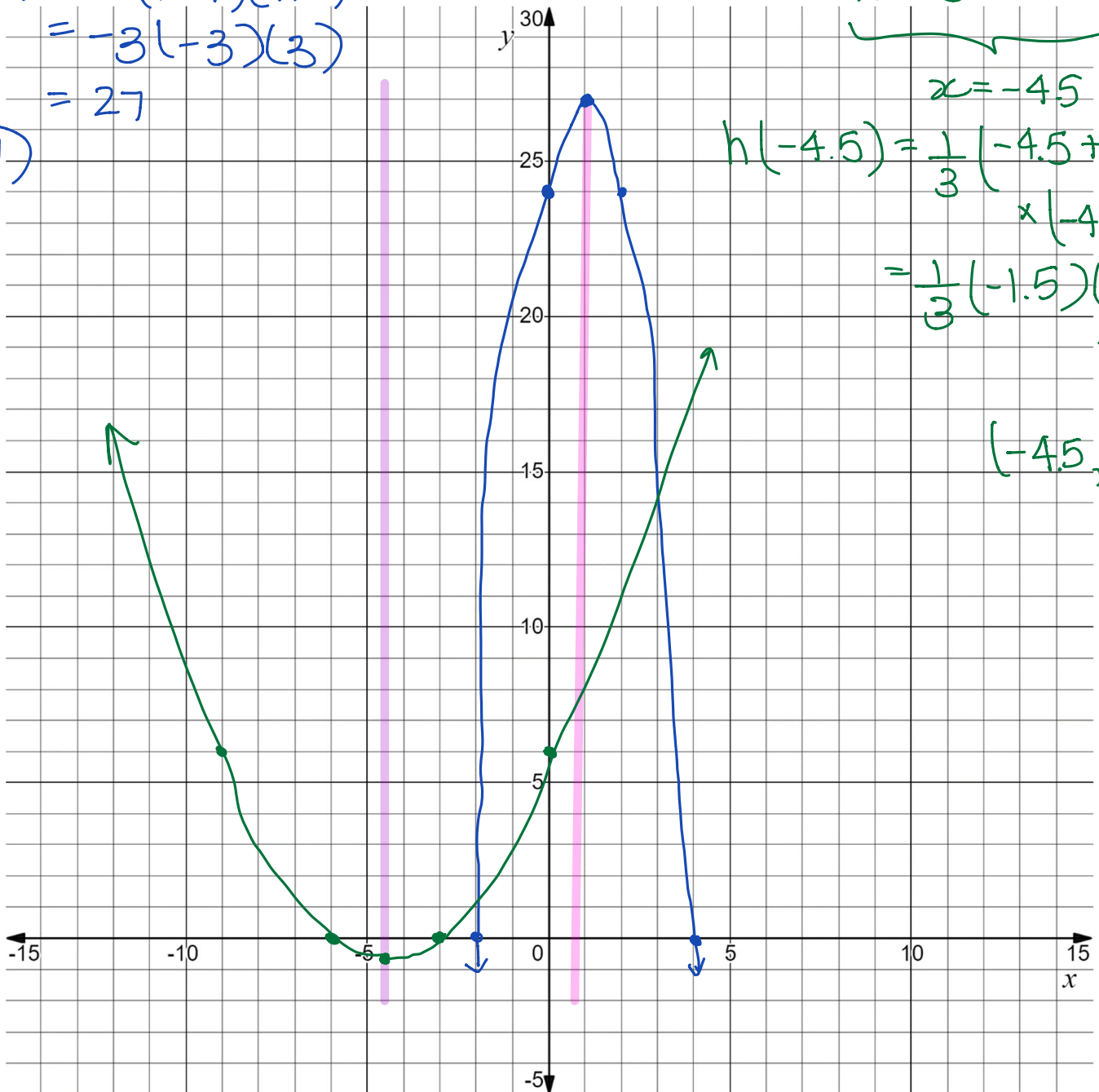
$$h(-4.5) = \frac{1}{3}(-4.5+3)$$

$$\times (-4.5+6)$$

$$= \frac{1}{3}(-1.5)(1.5)$$

$$= -\frac{3}{4}$$

$$(-4.5, -0.75)$$



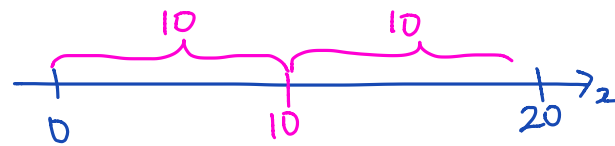
$h = 0$  when  $x = 0$

At a splash pad, water jets spray water from ground level. The path of the water from one of these jets forms an arch that can be defined by the function  $h = -0.15x^2 + 3x$ . Where  $h$  is the height of the water and  $x$  is the distance from jet. Both  $h$  and  $x$  are in meters.

$$h = -0.15x^2 + 3x + 0$$

$$= -0.15x(x - 20)$$

$x = 0$                        $x = 20$



a. Graph the function

b. State the domain and range of the function.

Domain:  $0 \leq x \leq 20$

Range:  $0 \leq y \leq 15$

c. what is the maximum height of the water?

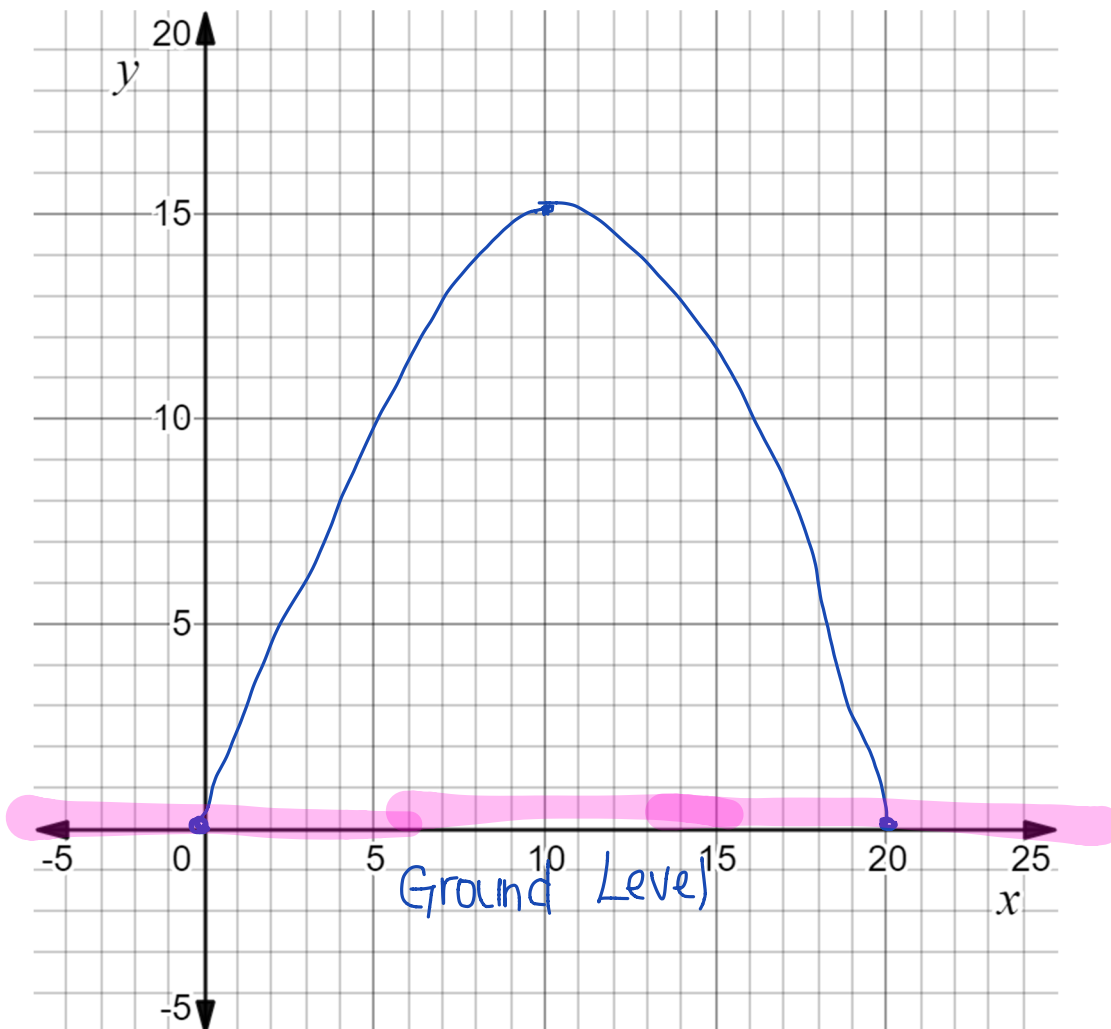
The maximum height of the water is 15m.

$$h = -0.15(10)^2 + 3(10)$$

$$= -15 + 30$$

$$= 15$$

vertex (10, 15)



$$y = -\frac{1}{2}x^2 + 6x - 10$$

↑ ↖ ↑  
y-int

|     |       |     |       |     |      |
|-----|-------|-----|-------|-----|------|
| $x$ | -3    | -2  | -1    | 0   | 1    |
| $y$ | -32.5 | -14 | -16.5 | -10 | -3.5 |

$$\begin{aligned}
 y &= -\frac{1}{2}(-1)^2 + 6(-1) - 10 \\
 &= -\frac{1}{2}(1) - 6 - 10 \\
 &= -0.5 - 6 - 10 \\
 &= -16.5
 \end{aligned}$$

$$\begin{aligned}
 y &= -\frac{1}{2}(1)^2 + 6(1) - 10 \\
 &= 3.5
 \end{aligned}$$

$$\begin{aligned}
 y &= -\frac{1}{2}(-2)^2 + 6(-2) - 10 \\
 &= -14
 \end{aligned}$$

### Quiz Question

$$y = x^2 + 4x + 0$$

↖ ↑  
y-int

|     |    |    |    |    |   |   |
|-----|----|----|----|----|---|---|
| $x$ | -4 | -3 | -2 | -1 | 0 | 1 |
| $y$ | 0  | -3 | -4 | -3 | 0 | 6 |

↑  
vertex
↖  
bigger  
vertex

$$\begin{aligned}
 y &= (-1)^2 + 4(-1) \\
 &= 1 - 4 \\
 &= -3
 \end{aligned}$$

$$\begin{aligned}
 y &= (1)^2 + 4(1) \\
 &= 6
 \end{aligned}$$

$$\begin{aligned}
 y &= (-2)^2 + 4(-2) \\
 &= -4
 \end{aligned}$$

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