# Polynomial Equations (Quadratics) in Factored Form

## Standard Form of a Quadratic

$$ax^2 + bx + c = 0$$

## Factored Form of a Quadratic ( Four Options )

$$(x + \_\_\_\_)(x + \_\_\_\_) = 0$$
$$(x - \_\_\_\_)(x - \_\_\_\_) = 0$$
$$(x + \_\_\_\_)(x - \_\_\_\_) = 0$$
$$(x - \_\_\_\_)(x + \_\_\_\_) = 0$$

Each blank is filled with a number.

**Zero Product Property** If $ab = 0$, then $a = 0$ or $b = 0$.

If one set of parentheses equals zero, then the product equals zero.

Key Point: The x-values that make each set of parentheses equal zero are the solutions to the quadratic function (equation).

Therefore, the solutions for "x" are also the x-intercepts of the quadratic function because y = 0 at these points.

Solve the equation for the solutions of x.

1) $(x + 9)(x - 2) = 0$

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$x + 9 = 0$ and $x - 2 = 0$

$x = -9$ and $x = 2$

2 solutions ; 2 x-intercepts

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2) $(2x + 8)(3x + 12) = 0$

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2) $(2x + 8)(3x + 12) = 0$

$2x + 8 = 0$ and $3x + 12 = 0$

$2x = -8$ $\quad$ $3x = -12$

$x = -4$ $\quad$ $x = -4$

only 1 solution; 1 x-intercept

Solve the equation for the solutions of x.

3) $8(9x + 27)(6x - 9) = 0$

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3) $8(9x + 27)(6x - 9) = 0$

$9x + 27 = 0$ and $6x - 9 = 0$

$9x = -27$ and $6x = 9$

$x = -3$ $x = \frac{9}{6} = \frac{3}{2}$

2 solutions ; 2 x-intercepts

4) Sketch a graph of the quadratic function $y = ( x - 4 ) ( x + 2 )$

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x-intercepts are: $(4,0)(-2,0)$

The x-coordinate of the vertex is the midpoint between the x-intercepts. Then, substitute that x-value and solve for the y-coordinate of the vertex.

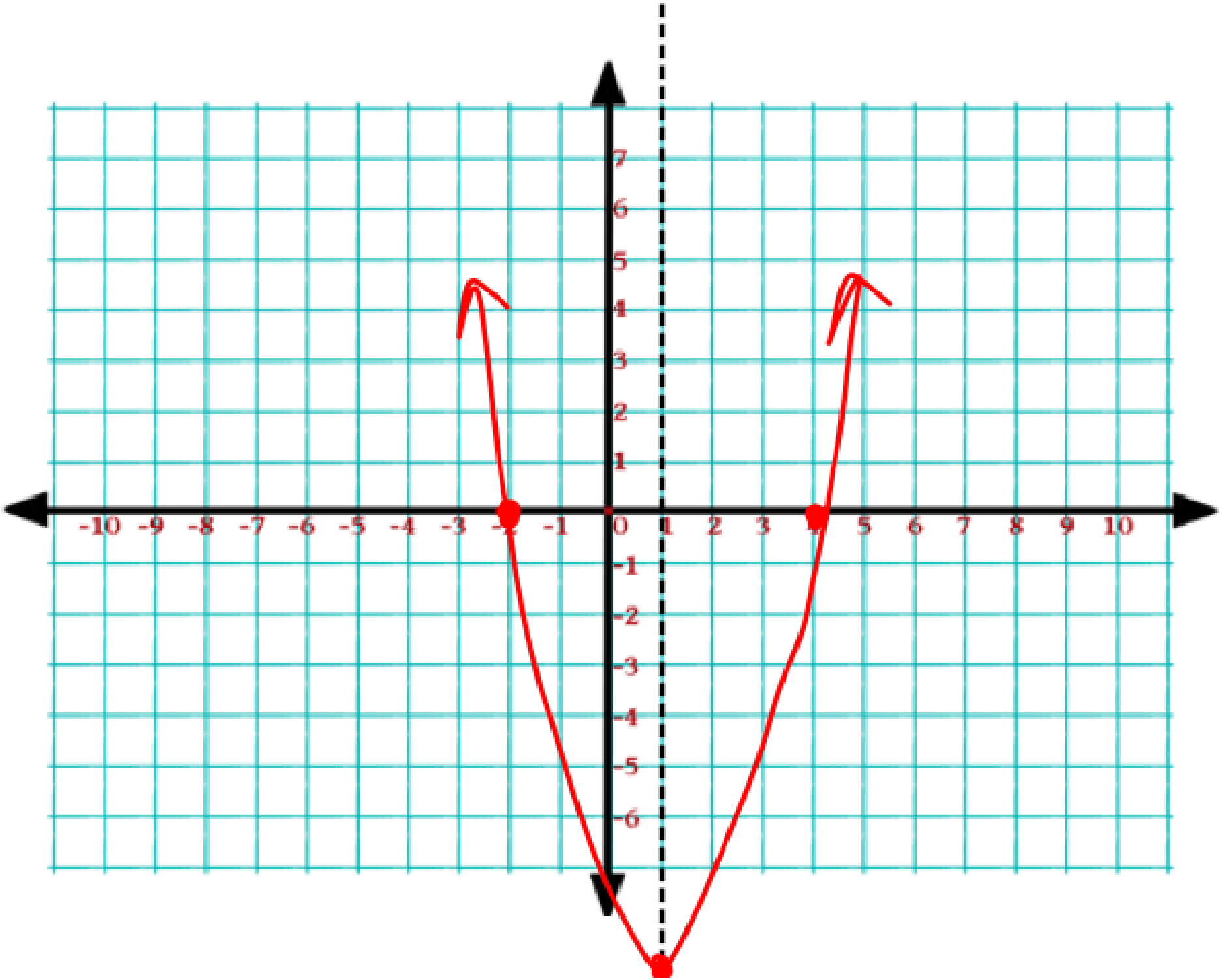
vertex $(1,-9)$

x-coordinate

$$\frac{4+-2}{2} = \frac{2}{2} = 1$$

y-coordinate

$$y = (1-4)(1+2)$$
$$= -3 \cdot 3$$
$$= -9$$


-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10
7 6 5 4 3 2 1 -1 -2 -3 -4 -5 -6

5) The archway entrance to the building can be modeled using this quadratic function $y = -0.2 ( x + 10 ) ( x - 10 )$ with the width and height measured in feet. How wide is the arch at the base? How tall is the arch at its highest point?

Hint: Sketch the parabola on a coordinate plane.

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Sketch the parabola on a coordinate plane.

Width is the difference between the x-intercepts.
Height is determined by finding the y-coordinate of the vertex.

Width

$10 - -10$

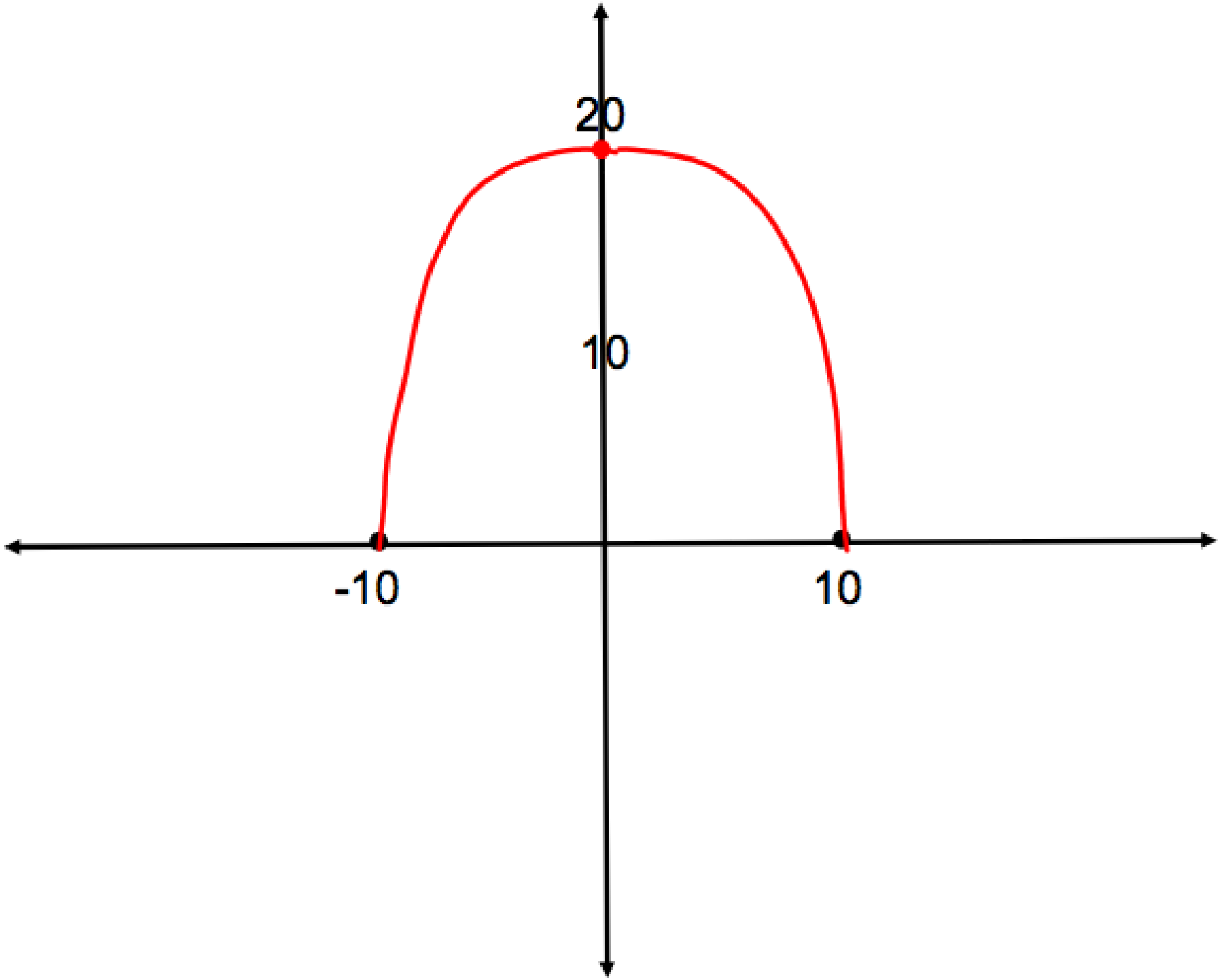
$10 + 10 = 20$ ft

height

$y = -.2(0+10)(0-10)$

$= -.2(10)(-10)$

$= 20$ ft


20
10
-10
10