

Determine the "a" value in factored form

April 27

Recall: Find the equation of a line with a slope of -4 passing through the point $(2, -1)$.

Linear eq: $Y = mx + b$

$m = -4$

$Y = -4x + b \leftarrow (2, -1)$

$-1 = -4(2) + b$

$-1 = -8 + b \rightarrow \therefore b = -1 + 8 = 7 \quad \therefore Y = -4x + 7$

Example 1 Determine the factored form of an equation that has zeros at $(3, 0)$ and $(12, 0)$ passing through the point $(4, -2)$ or x intercepts

Factored Form: $Y = a(x-r)(x-s)$ \leftarrow when $x=4, y=-2$

$Y = a(x-12)(x-3)$

Sub $x=4$ and $y=-2$

$-2 = a(4-12)(4-3)$

$-2 = a \cdot (-8) \cdot (1)$

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

$\therefore a = \frac{1}{4}$

$\therefore Y = \frac{1}{4}(x-12)(x-3)$

Example 2 The Dufferin Gate is a parabolic arch that is approximately 20 m tall and approximately 22 m wide.

= Distance between two x coordinates

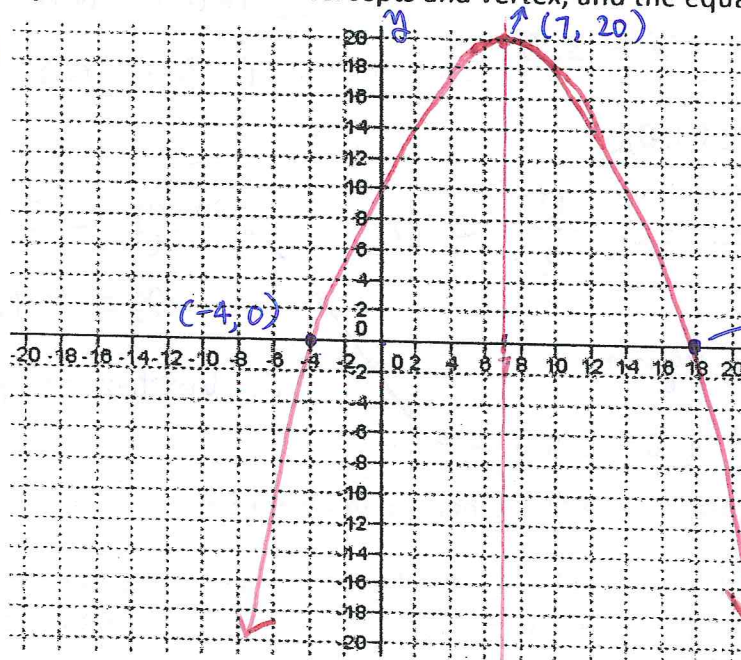
y coordinate of vertex

a) Sketch a graph of the arch with the left base located on the x -axis 4 units to the left of the y -axis. Label the x -intercepts and vertex, and the equation.

To find x coordinate of vertex: add two x intercepts: Then divide by 2

$\frac{18 + (-4)}{2} = \frac{14}{2}$

$\therefore 7$



x intercept = $(-4, 0)$

axis of symmetry

b) Determine an equation to model the arch

Factored Form: $y = a(x-r)(x-s)$

* Since $r = -4$ and $s = 18$

$$y = a(x+4)(x-18) \leftarrow \text{sub } (7, 20)$$

$$20 = a(7+4)(7-18)$$

$$20 = a(11)(-11)$$

$$20 = -121a$$

vertex
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$$a = \frac{20}{-121}$$

$$a = -\frac{20}{121} \text{ or } -0.165$$

$$\therefore y = -\frac{20}{121}(x+4)(x-18)$$

Review: Find the x-intercepts and vertex for the following equations in factored form.

1) $y = -0.2(x-4)(x+10)$
 $a \rightarrow \wedge \rightarrow r=4 \rightarrow s=-10$

∴ Two x intercepts are (4, 0) and (-10, 0)

* x coordinate of vertex

$$= \frac{4 + (-10)}{2} = \frac{-6}{2} = -3 \rightarrow \text{sub } x = -3 \text{ into eq.}$$

$$y = -0.2(-3-4)(-3+10)$$

$$y = -0.2(-7)(7) = 9.8$$

$$\therefore \text{vertex} = (-3, 9.8)$$

2) $y = (x+3.5)(x-3.5) \rightarrow a=1$

$$x+3.5=0 \quad x-3.5=0$$

$$x = -3.5 \quad x = 3.5$$

∴ Two x intercepts are (3.5, 0) and (-3.5, 0)

* x coordinate of vertex

$$\frac{3.5 + (-3.5)}{2} = \frac{0}{2} = 0$$

* sub $x=0 \rightarrow$ eqn

$$y = (0+3.5)(0-3.5)$$

$$y = 3.5 \times (-3.5)$$

$$y = -12.25$$

$$\therefore \text{Vertex} = (0, -12.25)$$

Homework: Worksheet #7i (do others for more practice), 8, 9, 12

Thinking practice: A point lies 2 units above the x-axis on the axis of symmetry of the parabola with equation $y = (x+4)(x-6)$. How far is it from this point to the point on the curve where $x = 5$?