Root Form of a Parabola

University of Minnesota

Preliminaries and Objectives

Preliminaries

- Parabolas
  - Standard Form
  - General Form
- Factor-Root Theorem
- Factoring

Objectives

- Graphing a parabola from root form
- Finding the axis of symmetry and vertex of a parabola in root form

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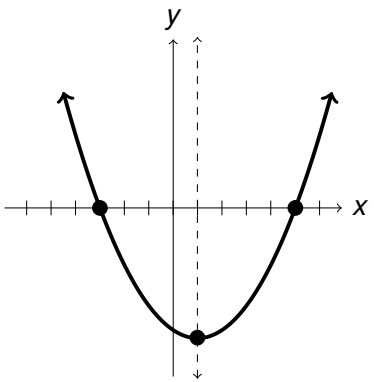
Example 1

$$y = x^2 - 2x - 15$$

$$y = (x + 3)(x - 5)$$



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Root Form

$$y = a(x - r)(x - s)$$

r and s are roots of the parabola

roots $=$ x-intercepts $=$ zeroes

Axis of symmetry at $x = \dfrac{r + s}{2}$

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Example 2

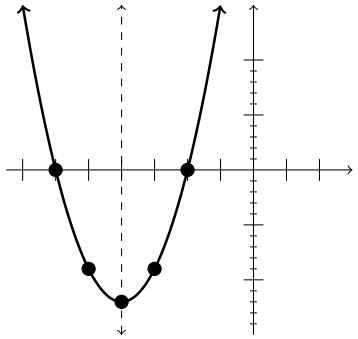
Graph $y = 3x^2 + 24x + 36$

$y = 3(x^2 + 8x + 12)$

$y = 3(x + 2)(x + 6)$

Axis of symmetry at $x = -4$

Vertex $= (-4, -12)$



Example 3

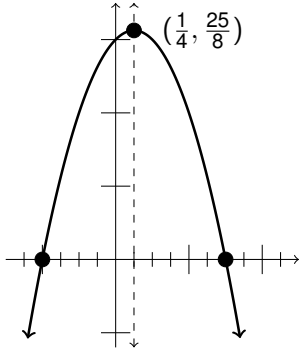
Graph $y = -2x^2 + x + 3$

$y = -(2x^2 - x - 3)$

$y = -(2x - 3)(x + 1)$

Roots occur where
$2x - 3 = 0$ and $x + 1 = 0$

Roots at $x = \frac{3}{2}$ and $x = -1$



Example 4

Find the vertex of the parabola $y = -4(x - 7)(x + 3)$

Roots at $x = 7$ and $x = -3$

$h = \frac{7 - 3}{2} = 2$

$k = -4(-5)(5) = 100$

Vertex at $(2, 100)$

Recap

Root Form of a Parabola

If $y = a(x - r)(x - s)$, then r and s are the roots (x-intercepts) of the parabola.

The axis of symmetry will be at

$$x = \frac{r + s}{2}$$