Root Form of a Parabola

UNIVERSITY OF MINNESOTA

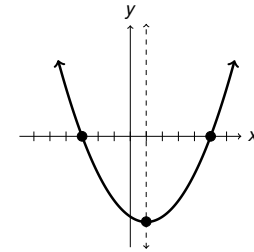## Preliminaries and Objectives

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

$$y = x^2 - 2x - 15$$
$$y = (x + 3)(x - 5)$$

Root Form

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

r and s are roots of the parabola

roots = x-intercepts = zeroes
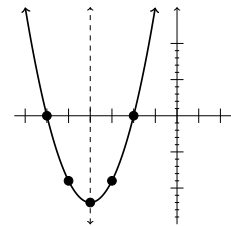
Axis of symmetry at $x = \dfrac{r + s}{2}$

Example 2

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

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

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

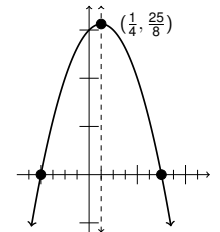Axis of symmetry at $x = -4$

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 $x = \dfrac{3}{2}$ and $x = -1$

$\left(\frac{1}{4}, \frac{25}{8}\right)$

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

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