

Write the equation for each parabola in standard form.

4. vertex $(-2, 1)$,
y-intercept 4

$$\text{vertex } (h, k) = (-2, 1)$$

$$h = -2$$

$$k = 1$$

Vertex form

$$y = a(x-h)^2 + k$$

Substitute $h = -2$ & $k = 1$:

$$\text{Eq. 1 } y = a(x+2)^2 + 1$$

To solve for "a":

② Pt $(0, 4)$ ← y-intercept 4

$$4 = a(0+2)^2 + 1$$

$$4 = a(4) + 1$$

$$\begin{array}{r} -1 \\ \hline 3 = a(4) \end{array}$$

$$\frac{3}{4} = \frac{a(4)}{4}$$

$$\frac{3}{4} = a \checkmark$$

Substitute $a = \frac{3}{4}$ to Eq. 1

$$y = \frac{3}{4}(x+2)^2 + 1$$

$$y = \frac{3}{4}(x^2 + 4x + 4) + 1$$

$$y = \frac{3}{4}x^2 + 3x + 3 + 1$$

$$\boxed{y = \frac{3}{4}x^2 + 3x + 4}$$

5. vertex $(3, -5)$,
point $(4, 1)$

Vertex Form

$$y = a(x-h)^2 + k$$

Substitute vertex $(3, -5)$

$$\text{Eq. 1 } y = a(x-3)^2 - 5$$

To solve for "a": use Pt $(4, 1)$

$$1 = a(4-3)^2 - 5$$

$$1 = a(1)^2 - 5$$

$$\begin{array}{r} +5 \\ \hline 6 = a \end{array}$$

$$6 = a \checkmark$$

Substitute $a = 6$ to Eq. 1:

$$y = 6(x-3)^2 - 5$$

$$= 6(x^2 - 6x + 9) - 5$$

$$= 6x^2 - 36x + 54 - 5$$

$$\boxed{y = 6x^2 - 36x + 49}$$

6. x intercepts (1, 0), (5, 0)
point (2, 6)

x-intercepts:

$$(1, 0) \rightarrow r_1 = 1$$

$$(5, 0) \rightarrow r_2 = 5$$

We use root form:

$$y = a(x - r_1)(x - r_2)$$

Substitute r_1 and r_2

$$\text{Eq. 1 } y = a(x - 1)(x - 5)$$

To solve for "a"; use Pt. (2, 6)

@ Pt (2, 6) in Eq. 1

$$6 = a(2 - 1)(2 - 5)$$

$$6 = a(1)(-3)$$

$$\frac{6}{-3} = \frac{a(-3)}{-3}$$

$$-2 = a \quad \checkmark \checkmark$$

Substitute $a = -2$ in Eq. 1

$$y = -2(x - 1)(x - 5)$$

$$= -2(x^2 - 5x - x + 5)$$

$$= -2(x^2 - 6x + 5)$$

$$y = -2x^2 + 12x + 10$$

7. roots 4, -2
point (5, -21)

$$\text{roots: } r_1 = 4; r_2 = -2$$

We use root form:

$$\text{Eq. 1 } y = a(x - 4)(x + 2)$$

To solve for "a", we
use Pt. (5, -21) in Eq. 1

$$-21 = a(5 - 4)(5 + 2)$$

$$-21 = a(1)(7)$$

$$\frac{-21}{7} = \frac{a(7)}{7}$$

$$-3 = a \quad \checkmark \checkmark$$

Substitute $a = -3$ in Eq. 1

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

$$= -3(x^2 + 2x - 4x - 8)$$

$$= -3(x^2 - 2x - 8)$$

$$y = -3x^2 + 6x + 8$$