Identify the vertex, axis of symmetry, min/max value, y-intercept, and x-intercepts of each. Then sketch the graph. Label the x-intercept(s), y-intercept, vertex, and axis of symmetry on each graph.

1) $y = x^2 + 8x + 12$

$f(x) = (x^2 + 8x \quad\quad) + 12$

$\left(\frac{8}{2}\right)^2 = (4)^2 = 16$

$f(x) = (x^2 + 8x + 16) + 12 - 16$

$f(x) = (x + 4)^2 - 4$

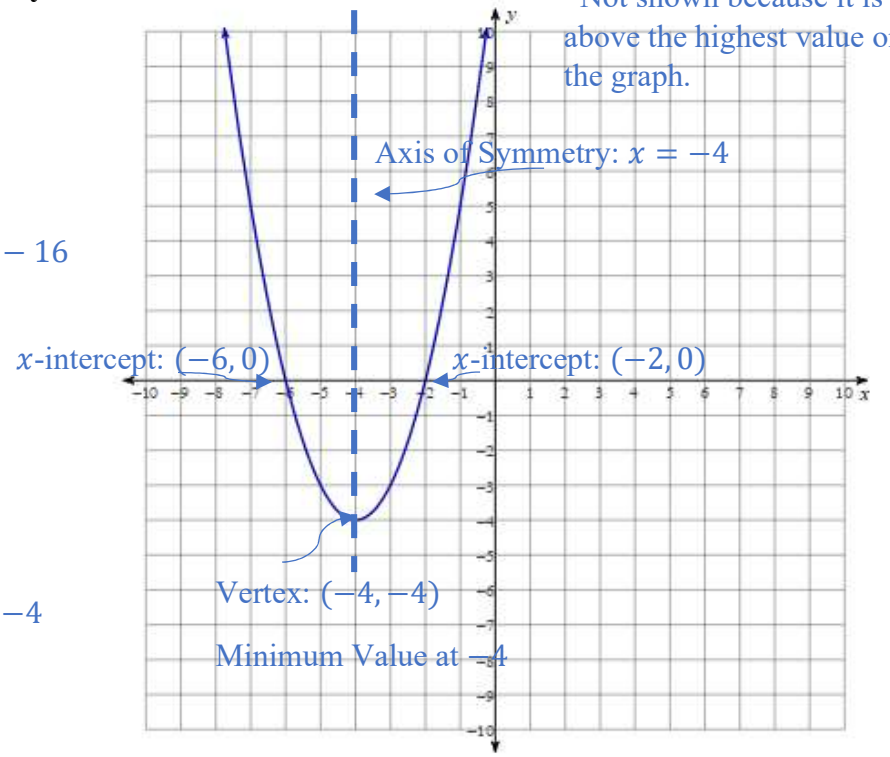
Vertex: $(-4, -4)$

Axis of Symmetry: $x = -4$

Min/Max Value: Minimum $= -4$

y-intercept: $(0, 12)$

x-intercept(s): $(-6, 0)$ & $(-2, 0)$



2) $y = -x^2 - 4x$

$f(x) = -(x^2 + 4x \quad\quad)$

$\left(\frac{4}{2}\right)^2 = (2)^2 = 4$

$f(x) = -(x^2 + 4x + 4) + 4$

$f(x) = -(x + 2)^2 + 4$

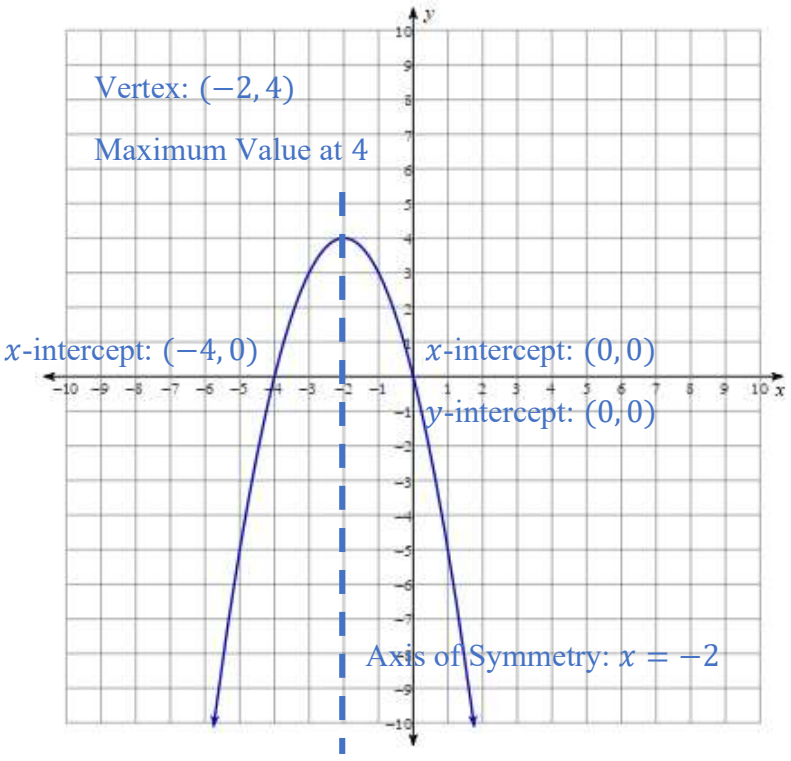
Vertex: $(-2, 4)$

Axis of Symmetry: $x = -2$

Min/Max Value: Maximum $= 4$

y-intercept: $(0, 0)$

x-intercept(s): $(-4, 0)$ & $(0, 0)$



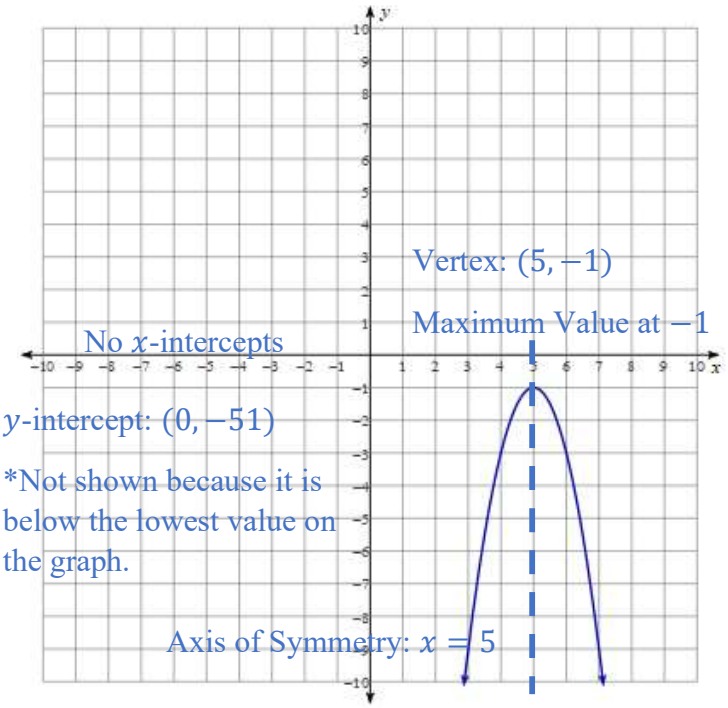
3) $y = -2x^2 + 20x - 51$

$f(x) = -2(x^2 - 10x \quad) - 51$

$\left(\frac{-10}{2}\right)^2 = (-5)^2 = 25$

$f(x) = -2(x^2 - 10x + 25) - 51 + 50$

$f(x) = -2(x - 5)^2 - 1$



Vertex: $(5, -1)$

Axis of Symmetry: $x = 5$

Min/Max Value: Maximum $= -1$

y-intercept: $(0, -51)$

x-intercept(s): None

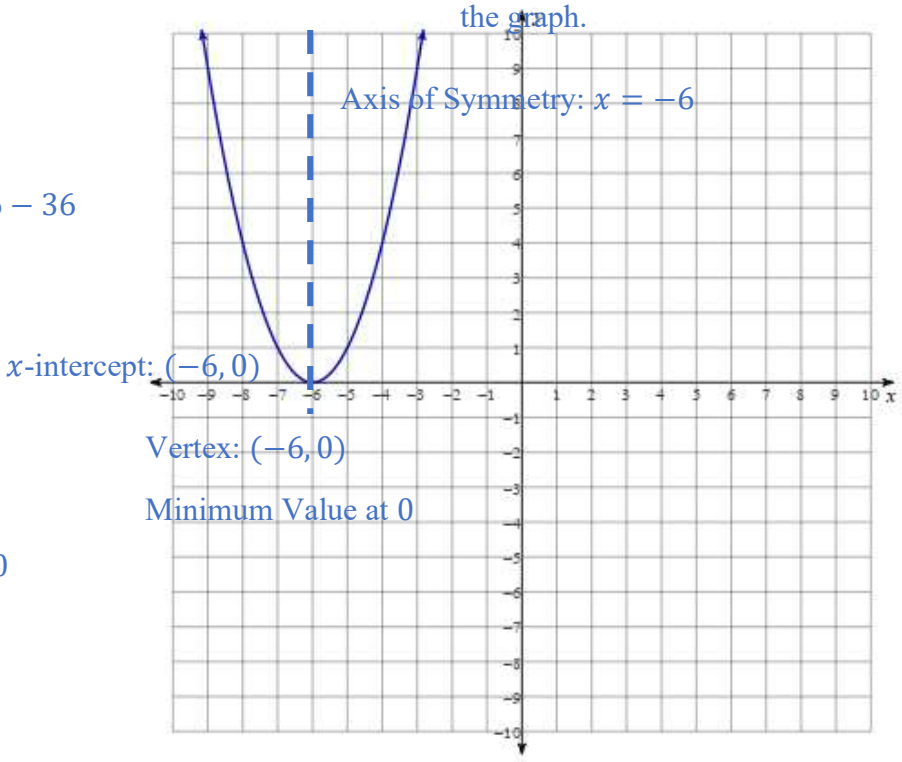
4) $y = x^2 + 12x + 36$

$f(x) = (x^2 + 12x \quad) + 36$

$\left(\frac{12}{2}\right)^2 = (6)^2 = 36$

$f(x) = (x^2 + 12x + 36) + 36 - 36$

$f(x) = (x + 6)^2$



Vertex: $(-6, 0)$

Axis of Symmetry: $x = -6$

Min/Max Value: Minimum $= 0$

y-intercept: $(0, 36)$

x-intercept(s): $(-6, 0)$

5) $y = -x^2 + 4x - 3$

$f(x) = -(x^2 - 4x \quad) - 3$

$\left(\frac{-4}{2}\right)^2 = (-2)^2 = 4$

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

$f(x) = -(x-2)^2 + 1$

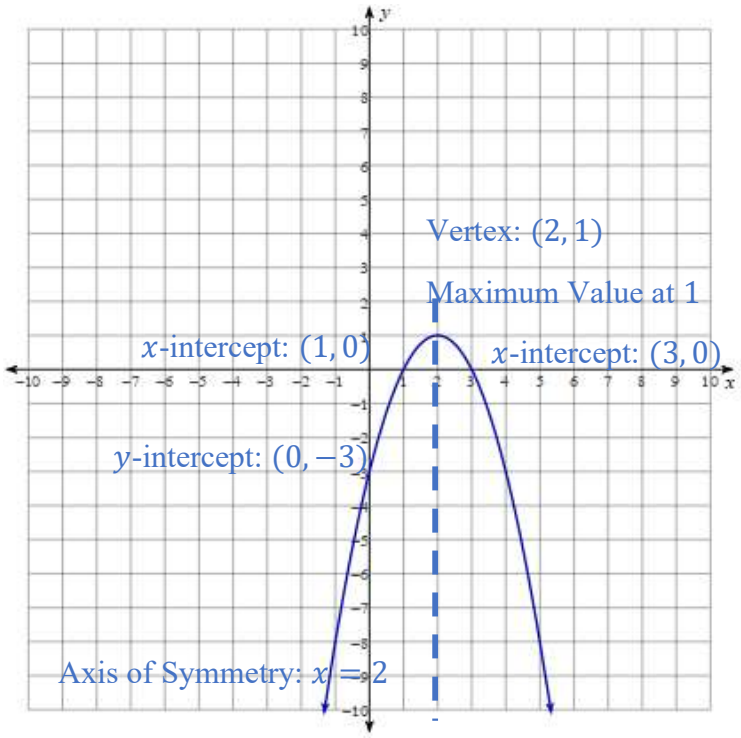
Vertex: $(2, 1)$

Axis of Symmetry: $x = 2$

Min/Max Value: Maximum $= 1$

y-intercept: $(0, -3)$

x-intercept(s): $(1, 0)$ & $(3, 0)$



6) $y = -2x^2 - 4x - 3$

$f(x) = -2(x^2 + 2x \quad) - 3$

$\left(\frac{2}{2}\right)^2 = (1)^2 = 1$

$f(x) = -2(x^2 + 2x + 1) - 3 + 2$

$f(x) = -2(x+1)^2 - 1$

Vertex: $(-1, -1)$

Axis of Symmetry: $x = -1$

Min/Max Value: Maximum $= -1$

y-intercept: $(0, -3)$

x-intercept(s): None