

Vertex Form of Parabolas

Use the information provided to write the vertex form equation of each parabola.

1) $y = x^2 + 16x + 71$

$$y = (x^2 + 16x + 8^2) + 71 + \frac{-64}{1}$$

$$= (x+8)^2 + 7$$

Vertex $(-8, +7)$

3) $y = -x^2 - 14x - 59$

$$y = -1(x^2 + 14x + 7^2) - 59 + \frac{49}{1}$$

$$= -1(x+7)^2 - 10$$

Vertex $(7, -10)$

5) $y = x^2 - 12x + 46$

$$y = (x^2 - 12x + 6^2) + 46 + \frac{-36}{1}$$

$$= (x-6)^2 + 10$$

Vertex $(6, 10)$

7) $y = x^2 - 6x + 5$

$$y = (x^2 - 6x + 3^2) + 5 + \frac{-9}{1}$$

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

Vertex $(3, -4)$

9) $\frac{1}{2}(y+4) = (x-7)^2$

\rightarrow multiply both sides by 2

$$2 \left(\frac{1}{2}(y+4) \right) = 2(x-7)^2$$

$$y+4 = 2(x-7)^2$$

$$y = 2(x-7)^2 - 4$$

Vertex $(7, -4)$

11) $162x + 731 = -y - 9x^2$

$$y = (-9x^2 - 162x) - 731$$

$$y = -9(x^2 + 18x + 9^2) - 731 + \frac{729}{1}$$

$$y = -9(x+9)^2 - 2$$

Vertex $(-9, 2)$

13) $y = x^2 + 10x + 33$

$$y = (x^2 + 10x + 5^2) + 33 + \frac{-25}{1}$$

$$y = (x+5)^2 + 8$$

Vertex $(-5, 8)$

2) $y = x^2 - 2x - 5$

$$y = (x^2 - 2x + 1^2) - 5 + \frac{-1}{1}$$

$$y = (x-1)^2 - 6$$

Vertex $(1, -6)$

4) $y = 2x^2 + 36x + 170$

$$y = 2(x^2 + 18x + 9^2) + 170 + \frac{-162}{2}$$

$$= 2(x+9)^2 + 8$$

Vertex $(-9, 8)$

6) $y = x^2 + 4x$

$$y = (x^2 + 4x + 2^2) + 0 + \frac{-4}{1}$$

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

Vertex $(-2, -4)$

8) $y = (x+5)(x+4)$

$$y = x^2 + 9x + 20$$

$$= (x^2 + 9x + \frac{9^2}{4}) + 20 + \frac{-81}{4}$$

$$= (x + \frac{9}{2})^2 - \frac{1}{4}$$

Vertex $(-\frac{9}{2}, -\frac{1}{4})$

10) $6x^2 + 12x + y + 13 = 0$

$$y = (-6x^2 - 12x) - 13$$

$$y = -6(x^2 + 2x + 1^2) - 13 + \frac{+6}{1}$$

$$y = -6(x+1)^2 - 7$$

Vertex $(-1, -7)$

12) $x^2 - 12x + y + 40 = 0$

$$y = -x^2 + 12x - 40$$

$$y = -1(x^2 - 12x + 6^2) - 40 + \frac{36}{1}$$

$$y = -1(x-6)^2 - 4$$

Vertex $(6, -4)$

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

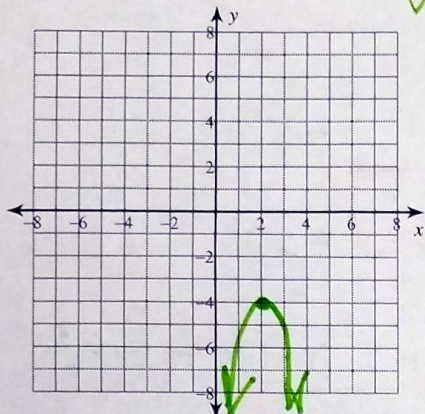
$$y = (x+3)^2 - 6$$

Vertex $(-3, -6)$

Identify the vertex and axis of symmetry of each. Then sketch the graph.

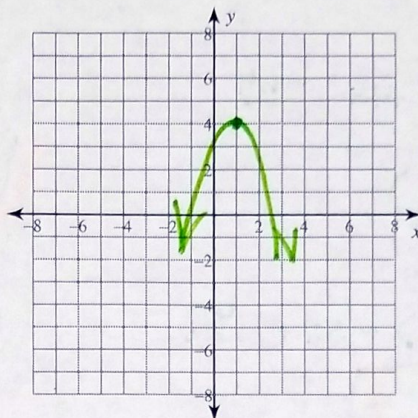
15) $f(x) = -3(x-2)^2 - 4$

Vertex $(2, -4)$
a.o.s $x = 2$



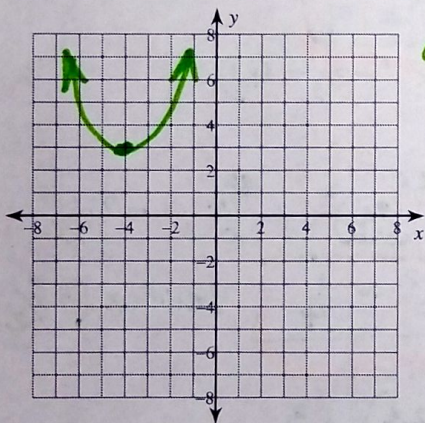
16) $f(x) = -\frac{1}{4}(x-1)^2 + 4$

Vertex $(1, 4)$
a.o.s $x = 1$



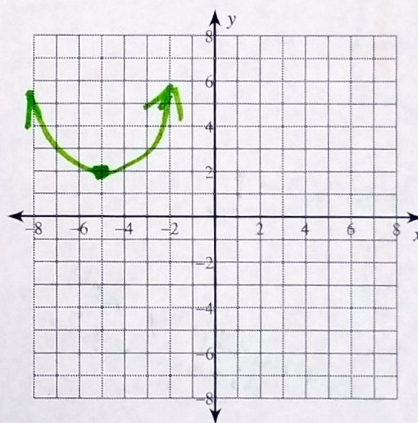
17) $f(x) = \frac{1}{4}(x+4)^2 + 3$

Vertex $(-4, 3)$
a.o.s $x = -4$



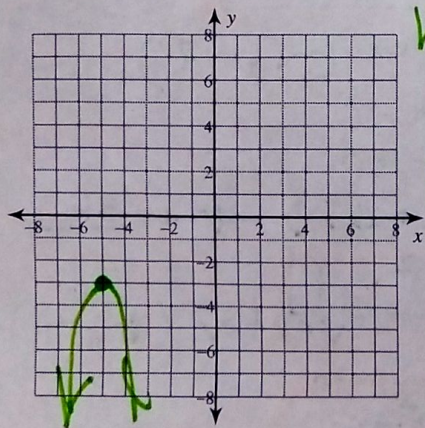
18) $f(x) = \frac{1}{4}(x+5)^2 + 2$

Vertex $(-5, 2)$
a.o.s $x = -5$



19) $f(x) = -2(x+5)^2 - 3$

Vertex $(-5, -3)$
a.o.s $x = -5$



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

Vertex $(-2, -1)$
a.o.s $x = -2$

