

Properties of Parabolas

Date _____ Period _____

Identify the vertex of each.

1) $y = x^2 + 16x + 64$
 $(-8, 0)$

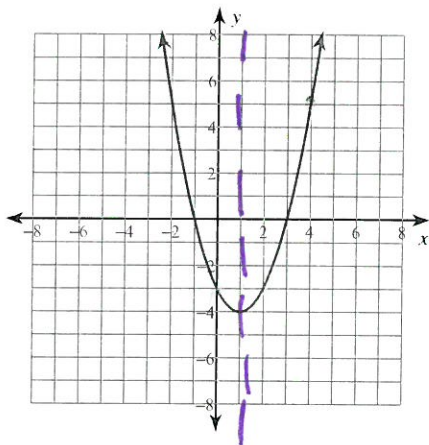
2) $y = 2x^2 - 4x - 2$
 $(1, -4)$
 $x = \frac{-b}{2a} = \frac{4}{2 \cdot 2} = \frac{4}{4} = 1$

3) $y = -x^2 + 18x - 75$
 $(9, 6)$

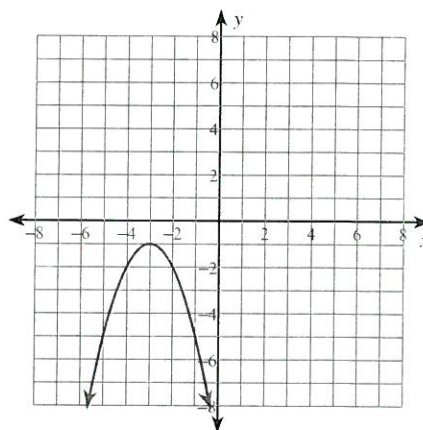
4) $y = -3x^2 + 12x - 10$
 $(2, 2)$

Graph each equation.

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

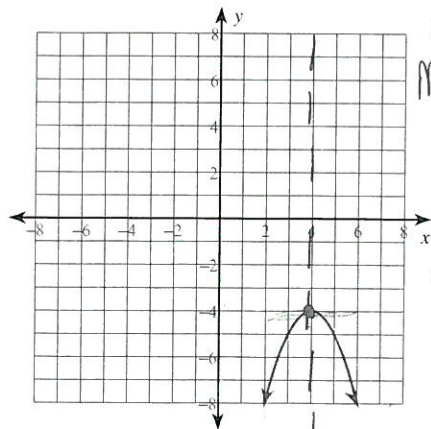


6) $y = -x^2 - 6x - 10$



Identify the min/max value of each. Then sketch the graph.

7) $f(x) = -x^2 + 8x - 20$



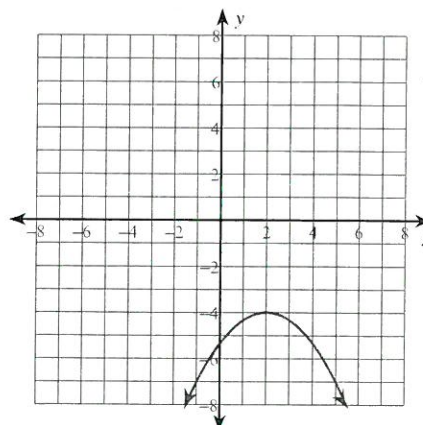
Max value = -4

max = -4

$$x = \frac{-8}{-2} = 4$$

$$\begin{aligned} -16 + 32 - 20 \\ 16 - 20 \\ -4 \end{aligned}$$

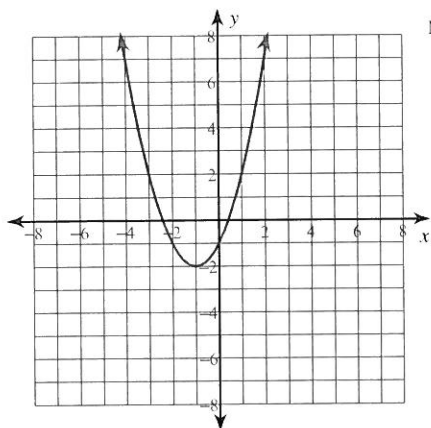
8) $f(x) = -\frac{1}{3}x^2 + \frac{4}{3}x - \frac{16}{3}$



Max value = -4

-4 = max

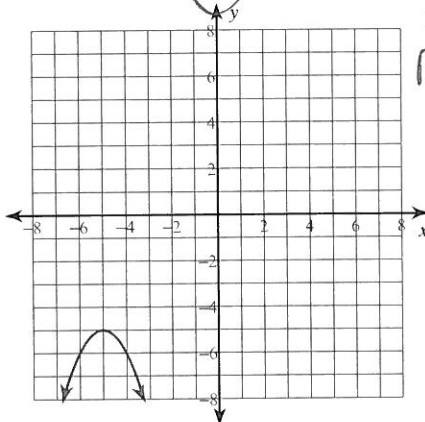
$$9) f(x) = x^2 + 2x - 1$$



min
-2
Min value = -2

$$10) f(x) = -x^2 - 10x - 30$$

$a = -1 \quad b = -10 \quad c = -30$



Max value = -5
max
-5

Identify the vertex, axis of symmetry, and min/max value of each.

$$11) f(x) = 3x^2 - 54x + 241$$

Vertex: (9, -2)
Axis of Sym.: $x = 9$
Min value = -2

$$12) f(x) = x^2 - 18x + 86$$

Vertex: (9, 5)
Axis of Sym.: $x = 9$
Min value = 5

$$13) f(x) = -\frac{4}{5}x^2 + \frac{48}{5}x - \frac{114}{5}$$

Vertex: (6, 6)
Axis of Sym.: $x = 6$
Max value = 6

$$14) f(x) = -2x^2 - 20x - 46 \quad -2(-5)^2 - 20(-5) - 46$$

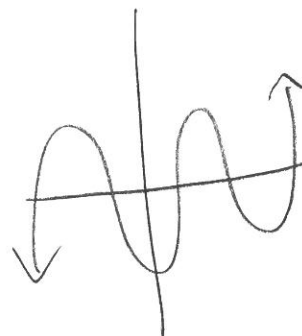
Vertex: (-5, 4)
Axis of Sym.: $x = -5$
Max value = 4

$$15) f(x) = -\frac{1}{4}x^2 + 7$$

Vertex: (0, 7)
Axis of Sym.: $x = 0$
Max value = 7

$$16) f(x) = x^2 - 12x + 44$$

Vertex: (6, 8)
Axis of Sym.: $x = 6$
Min value = 8



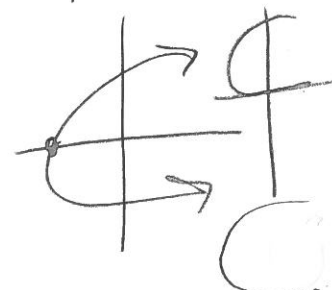
$$17) f(x) = \frac{1}{4}x^2 - x + 9$$

$a = \frac{1}{4} \quad b = -1 \quad c = 9$
 $-\frac{b}{2a} = \frac{1}{2 \cdot \frac{1}{4}} = \frac{1}{\frac{1}{2}} = 2$

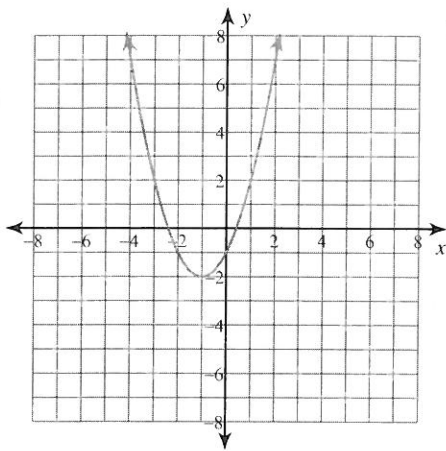
Vertex: (2, 8)
Axis of Sym.: $x = 2$
Min value = 8

$$18) f(x) = x^2 + 4x + 5$$

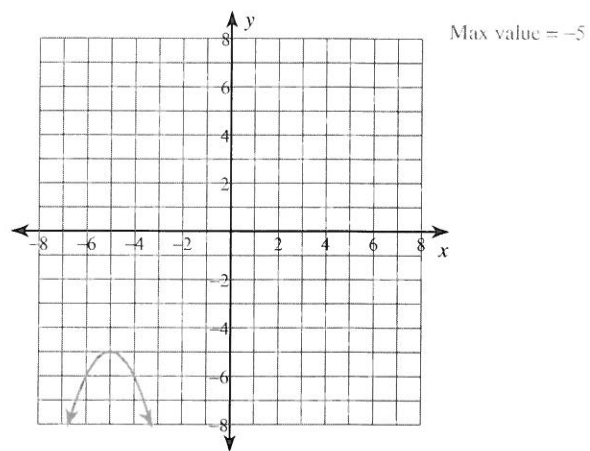
Vertex: (-2, 1)
Axis of Sym.: $x = -2$
Min value = 1



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



10) $f(x) = -x^2 - 10x - 30$



Identify the vertex, axis of symmetry, and min/max value of each.

11) $f(x) = 3x^2 - 54x + 241$

Vertex: $(9, -2)$
 Axis of Sym.: $x = 9$
 Min value = -2

12) $f(x) = x^2 - 18x + 86$

Vertex: $(9, 5)$
 Axis of Sym.: $x = 9$
 Min value = 5

13) $f(x) = -\frac{4}{5}x^2 + \frac{48}{5}x - \frac{114}{5}$

Vertex: $(6, 6)$
 Axis of Sym.: $x = 6$
 Max value = 6

14) $f(x) = -2x^2 - 20x - 46$

Vertex: $(-5, 4)$
 Axis of Sym.: $x = -5$
 Max value = 4

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

Vertex: $(0, 7)$
 Axis of Sym.: $x = 0$
 Max value = 7

16) $f(x) = x^2 - 12x + 44$

Vertex: $(6, 8)$
 Axis of Sym.: $x = 6$
 Min value = 8

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

Vertex: $(2, 8)$
 Axis of Sym.: $x = 2$
 Min value = 8

18) $f(x) = x^2 + 4x + 5$

Vertex: $(-2, 1)$
 Axis of Sym.: $x = -2$
 Min value = 1

$$\frac{-b}{2a} = 18$$

$$-b = 36a$$

$$b = (-36a)$$

$$(18, 1.6)$$

$$y = ax^2 + bx + c$$

$$1.6 = ax^2 + bx + c$$

$$1.6 = a(18)^2 + b(18) + 1.5$$

$$1.6 = a(18)^2 + -36a(18) + 1.5$$

$$1.6 = 324a + -648a + 1.5$$

$$1.6 = -324a + 1.5$$

$$.1 = -324a$$

$$-.00031 = a$$

$$1.6 = (-.00031)(18)^2 + b(18) + 1.5$$

$$b = -36a$$

$$b = -36(-.00031)$$

Vertex Form of Parabolas

Date _____ Period _____

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

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

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

$\left(\frac{16}{2}\right)^2 = 64$
 $x^2 + 16x + 64 = -71 + 64$
 $(x + 8)^2 = -7$
 $(x + 8)^2 + 7 = 7$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

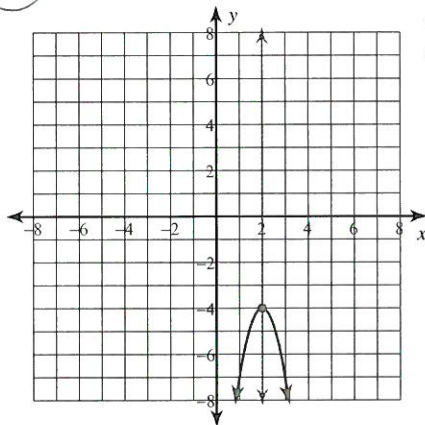
$$y = (x + 5)^2 + 8$$

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

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

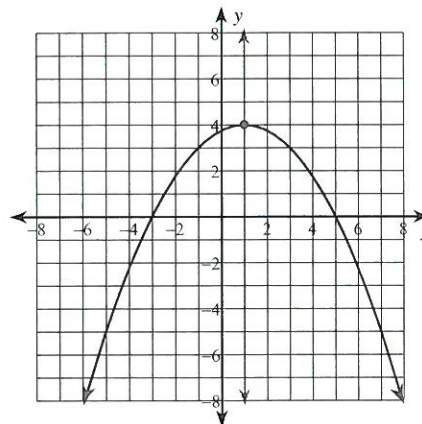
Identify the vertex and axis of symmetry of each. Then sketch the graph.

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



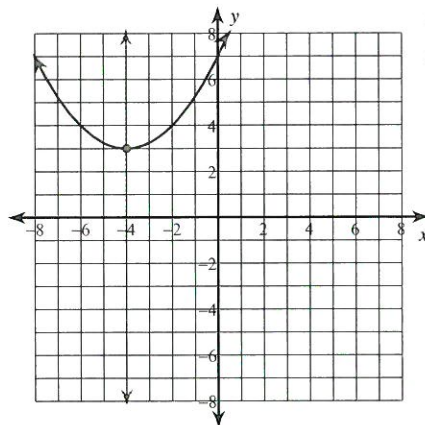
Vertex: $(2, -4)$
Axis of Sym.: $x = 2$

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



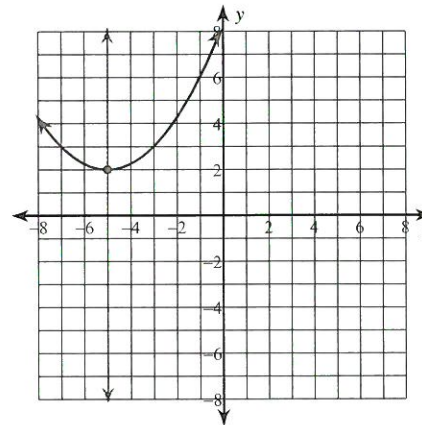
Vertex: $(1, 4)$
Axis of Sym.: $x = 1$

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



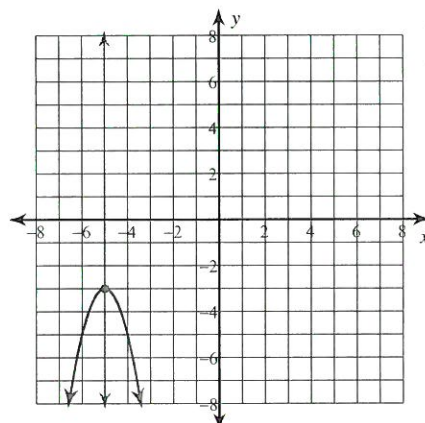
Vertex: $(-4, 3)$
Axis of Sym.: $x = -4$

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



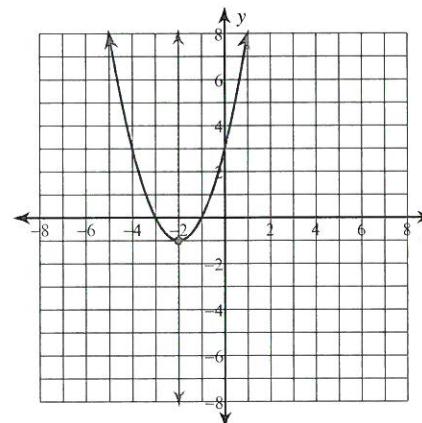
Vertex: $(-5, 2)$
Axis of Sym.: $x = -5$

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



Vertex: $(-5, -3)$
Axis of Sym.: $x = -5$

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



Vertex: $(-2, -1)$
Axis of Sym.: $x = -2$