

For each equation written in standard form, identify the vertex and axis of symmetry. Then state whether the parabola opens up or down, and whether it is narrower or wider than the parent graph  $y = x^2$ .

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

Vertex:  $(2, -4)$  Axis of Symmetry:  $x = 2$  Opens: Up or Down Compare: Wider or Narrower

2.  $y = -x^2 - 4x$       $a = -1$     $b = -4$     $c = 0$       $y = -(-2)^2 - 4(-2)$   
 $\frac{-b}{2a} = \frac{4}{-2} = -2$       $(-2, ?)$       $= -4 + 8 = 4$   
 $(-2, 4)$

Vertex:  $(-2, 4)$  Axis of Symmetry:  $x = -2$  Opens: Up or Down Compare: Wider or Narrower SAME

3.  $y = 4x^2 + 8x + 1$       $a = 4$     $b = 8$     $c = 1$   
 $\frac{-b}{2a} = \frac{-8}{2(4)} = \frac{-8}{8} = -1$       $y = 4(-1)^2 + 8(-1) + 1$   
 $= 4(1) + (-8) + 1$   
 $= 4 - 8 + 1 = -3$

Vertex:  $(-1, -3)$  Axis of Symmetry:  $x = -1$  Opens: Up or Down Compare: Wider or Narrower

For each equation written in vertex form, identify the vertex and axis of symmetry. Then state whether the parabola opens up or down, and whether it is narrower or wider than the parent graph  $y = x^2$ .

4.  $y = (x - 7)^2 + 7$       $h = 7$     $k = 7$   
 $a = 1$     $h$     $k$

Vertex:  $(7, 7)$  Axis of Symmetry:  $x = 7$  Opens: Up or Down Compare: Wider or Narrower SAME

5.  $y = 2(x + 3)^2 - 5$       $h = -3$     $k = -5$     $a = 2$

Vertex:  $(-3, -5)$  Axis of Symmetry:  $x = -3$  Opens: Up or Down Compare: Wider or Narrower

6.  $y = -(x + 1)^2 - 4$       $h = -1$     $k = -4$     $a = -1$

Vertex:  $(-1, -4)$  Axis of Symmetry:  $x = -1$  Opens: Up or Down Compare: Wider or Narrower SAME

For each equation written in intercept form, identify the vertex and axis of symmetry. Then state whether the parabola opens up or down, and whether it is narrower or wider than the parent graph  $y = x^2$ .

7.  $y = -3(x-1)(x+4)$

$p = 1 \quad q = -4$   
 $\frac{p+q}{2} = \frac{1+(-4)}{2} = -\frac{3}{2}$   
 $y = -3(-\frac{3}{2}-1)(-\frac{3}{2}+4)$   
 $= -3(-\frac{5}{2})(\frac{5}{2}) = -3(-\frac{25}{4}) = \frac{75}{4}$

Vertex:  $(-\frac{3}{2}, \frac{75}{4})$  Axis of Symmetry:  $X = -\frac{3}{2}$  Opens: Up or **Down** Compare: Wider or **Narrower**

8.  $y = (x+2)(x-4)$

$p = -2 \quad q = 4$   
 $\frac{p+q}{2} = \frac{-2+4}{2} = \frac{2}{2} = 1$   
 $y = (1+2)(1-4)$   
 $= (3)(-3)$   
 $= -9$

Vertex:  $(1, -9)$  Axis of Symmetry:  $X = 1$  Opens: Up or **Down** Compare: Wider or **Narrower**  
SAME

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

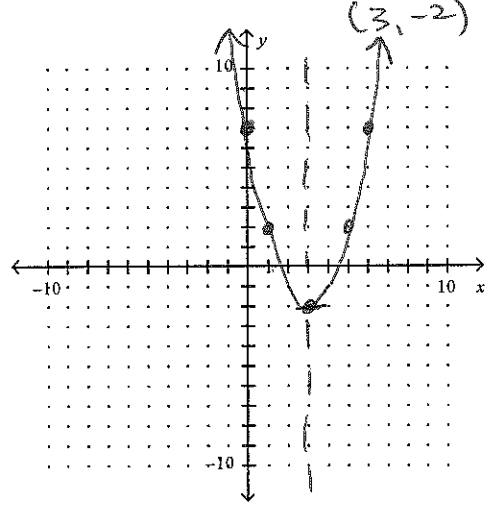
$p = -6 \quad q = -2$   
 $\frac{p+q}{2} = \frac{-6+(-2)}{2} = -\frac{8}{2} = -4$   
 $y = -\frac{1}{2}(-4+6)(-4+2)$   
 $= -\frac{1}{2}(2)(-2) = -\frac{1}{2}(-4) = -2$

Vertex:  $(-4, -2)$  Axis of Symmetry:  $X = -4$  Opens: Up or **Down** Compare: **Wider** or Narrower

For 10 – 12, graph the function. Clearly show the vertex, axis of symmetry, and 4 other points.

10.  $y = x^2 - 6x + 7$

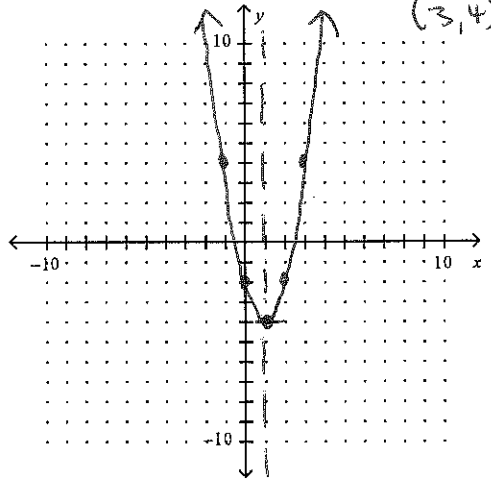
$a = 1 \quad b = -6 \quad c = 7$   
 $\frac{-b}{2a} = \frac{6}{2(1)} = 3$   
 $(3, ?)$   $y = 3^2 - 6(3) + 7$   
 $y = 9 - 18 + 7 = -2$   
 $(3, -2)$



$x = 1 \quad (1, ?)$   
 $y = 1^2 - 6(1) + 7$   $(1, 2)$   
 $= 1 - 6 + 7 = 2$

11.  $y = 2(x-1)^2 - 4$

$(1, -4)$   
 $(0, ?)$   $y = 2(0-1)^2 - 4$   
 $= 2 - 4 = -2$   
 $(0, -2)$   
 $(3, ?)$   $y = 2(3-1)^2 - 4$   
 $= 2(4) - 4 = 4$   
 $(3, 4)$



12.  $y = -2(x-4)(x-2)$

$p = 4 \quad q = 2$   
 $\frac{p+q}{2} = \frac{4+2}{2} = 3$   $(3, ?)$   
 $y = -2(3-4)(3-2)$   
 $= -2(-1)(1) = 2$   $(3, 2)$   
 $(1, ?)$   $y = -2(1-4)(1-2)$   
 $= -2(-3)(-1) = -6$

