SECTION 11-2: THE PARABOLA

Directions: Name the coordinates of the vertex and focus, and the equation of the directrix of the parabola defined by each equation. Then graph the equation.

1.) \((x - 2)^2 = 8(y + 1)\)
   
   \[4p = 8\]
   \[p = 2\]

   Test \(y = 1\)
   \((x - 2)^2 = 16\)
   \(x - 2 = \pm 4\)
   \(x = 6, -2\)

   Vertex: \((2, -1)\)
   Focus: \((2, 1)\)
   Directrix: \(y = -3\)
   Test Pts: \((0, 1)\) \((-2, 1)\)

2.) \((y + 2)^2 = -16(x - 3)\)

   \[4p = -16\]
   \[p = -4\]

   Test \(x = -1\)
   \((y + 2)^2 = 16\)
   \(y + 2 = \pm 4\)
   \(y = 6, -10\)

   Vertex: \((3, -2)\)
   Focus: \((-1, -2)\)
   Directrix: \(x = 7\)
   Test Pts: \((-1, 6)\) \((-1, -10)\)

Directions: For each equation, write the standard form. Then, name the coordinates of the vertex and focus, and the equation of the directrix of the parabola defined by each equation. Then graph the equation.

3.) \(x^2 - 2x + 1 = 8y - 16\)

   \(x^2 - 2x + 1 = 8(y - 2)\)
   \((x - 1)^2 = 8(y - 2)\)
   \[4p = 8\]
   \[p = 2\]

   Test pt \(y = 4\)
   \((x - 1)^2 = 16\)
   \(x - 1 = \pm 4\)
   \(x = 5, -3\)

   Standard Form: \((x - 1)^2 = 8(y - 2)\)
   Vertex: \((1, 2)\)
   Focus: \((1, 4)\)
   Directrix: \(y = 0\)
   Test Pts: \((5, 4)\) \((-3, 4)\)

4.) \(y^2 + 6y + 9 = 16 - 16x\)

   \((y + 3)^2 = 16(x - 1)\)
   \[4p = 16\]
   \[p = -4\]

   Test pt \(x = -3\)
   \((y + 3)^2 = -16\)
   \(y + 3 = \pm 4\)
   \(y = 5, -11\)

   Standard Form: \((y + 3)^2 = 16(x - 1)\)
   Vertex: \((1, -3)\)
   Focus: \((-3, -3)\)
   Directrix: \(x = 5\)
   Test Pts: \((-3, 5)\) \((-3, -11)\)
5.) \(-4x + 4 = y^2 + 10y + 25\)
\[(y+5)^2 = -4(x-1)\]

-4p = -4
p = -1

Test pt: x = 0
\[(y+5)^2 = 4\]
\[y+5 = \pm 2\]
\[y = -3, -7\]
(0, -3) (0, -7)

Vertex: \((1, -5)\)  Focus: \((0, 5)\)
Directrix: \(x = 2\)  Test Pts: (0, -3) (0, -7)

6.) \(x^2 + 8x + 4y + 8 = 0\)
\[x^2 + 8x + 16 = -4y - 8 + 16\]
\[(x+4)^2 = -4(y+2)\]

-4p = -4
p = -1

Test pt: y = 1
\[(x+4)^2 = 4\]
\[x+4 = \pm 2\]
\[x = -2, -6\]
(-2, 1) (-6, 1)

Vertex: \((-4, 2)\)  Focus: \((-4, 1)\)
Directrix: \(y = 3\)  Test Pts: __________________

**Directions:** Write the equation of the parabola that meets each set of conditions. Then graph the equation.

7.) Focus: \((1, 3)\)  Vertex: \((1, 2)\)

\[(x-1)^2 = 4\]
\[x-1 = \pm 2\]
\[x = 3, -1\]

Test \(y = 3\)
\[(x-1)^2 = 4\]
\[x-1 = \pm 2\]
\[x = 3, -1\]

Standard Form: \((x-1)^2 = 4(y-2)\)
Vertex: \((1, 2)\)  Focus: \((1, 3)\)
Directrix: \(y = 1\)  Test Pts: (3, 3) (-1, 3)

8.) Focus: \((2, 1)\)  Directrix: \(x = -2\)

\[(y-1)^2 = 16\]
\[y-1 = \pm 4\]
\[y = 5, -3\]

Test \(x = 2\)
\[(y-1)^2 = 16\]
\[y-1 = \pm 4\]
\[y = 5, -3\]

Standard Form: \((y-1)^2 = 8(x-0)\)
Vertex: \((0, 1)\)  Focus: \((2, 1)\)
Directrix: \(x = -2\)  Test Pts: (2, 5) (2, -3)