

**Circles**

For #1-3, find the standard form of the equation of the circle with the given characteristics.

1. Center at origin; radius: 4

$$x^2 + y^2 = 16$$

2. Center: (3, 7); point on circle: (1, 0)

$$r = \sqrt{2^2 + 7^2} = \sqrt{53}$$

$$(x-3)^2 + (y-7)^2 = 53$$

3. Center: (5, -6); diameter:  $4\sqrt{3}$

$$r = 2\sqrt{3}$$

$$r^2 = (2\sqrt{3})(2\sqrt{3})$$

$$4(3) = 12$$

$$(x-5)^2 + (y+6)^2 = 12$$

For #4-5, write the equation of the circle in standard form. Then identify its center and radius.

$$x^2 - 2x + y^2 + 6y + 9 = 0$$

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

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

Center: (1, -3)  
radius: 1

$$9x^2 + 54x + 9y^2 - 36y + 17 = 0$$

$$9x^2 + 54x + 9y^2 - 36y + 17 = 0$$

$$9(x^2 - 6x + \frac{9}{2}) + 9(y^2 - 4y + \frac{4}{2}) = -17 + 81 + 36$$

$$\frac{9(x-3)^2}{9} + \frac{9(y-2)^2}{9} = \frac{100}{9}$$

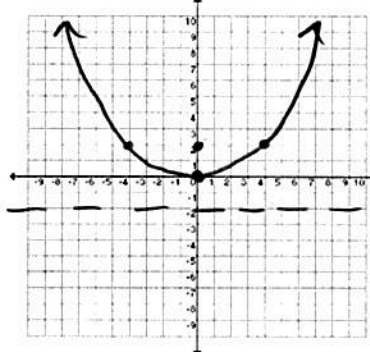
$$(x-3)^2 + (y-2)^2 = \frac{100}{9}$$

Center = (3, 2)  
radius =  $\frac{10}{3}$

**Parabolas**

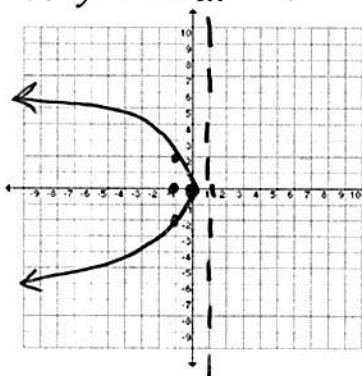
For #6-9, find the vertex, focus, and directrix for each parabola. Then draw a graph.

6.  $x^2 = 8y$



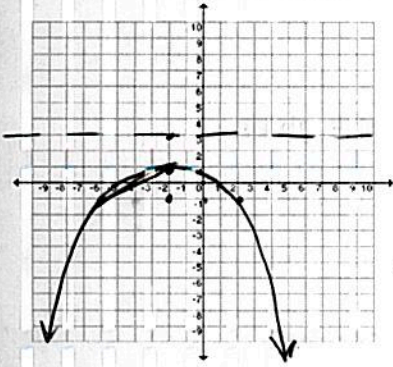
V: (0, 0)  
F: (0, 2)  
Dir:  $y = -2$   
Direction of opening = up  
 $4p = 8$   
 $p = 2$

7.  $y^2 = -4x$



V: (0, 0)  
F: (-1, 0)  
Dir:  $x = 1$   
Direction of opening = left  
 $4p = 4$   
 $p = 1$

$$8. (x + 2)^2 = -8(y - 1)$$



$$V: (-2, 1)$$

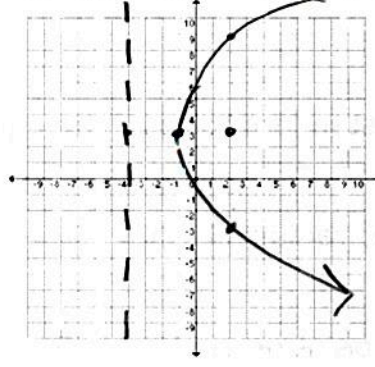
$$F: (-2, -1)$$

$$\text{Dir: } y = 3$$

$$4p = 8$$

$$p = 2$$

$$9. (y - 3)^2 = 12(x + 1)$$



$$V: (-1, 3)$$

$$F: (2, 3)$$

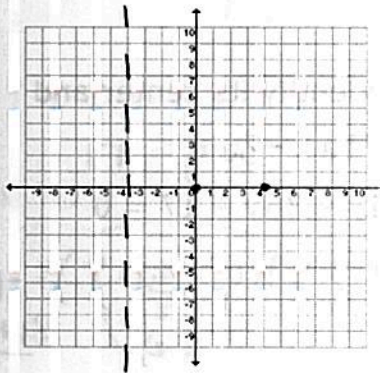
$$\text{Dir: } x = -4$$

$$4p = 12$$

$$p = 3$$

For #10-13, find an equation of a parabola using the given coordinates.

$$10. \text{ Focus } (4, 0); \text{ directrix } x = -4$$



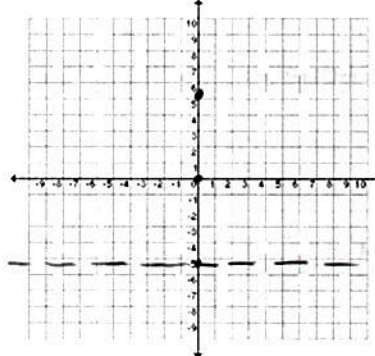
$$+y^2 \curvearrowright$$

$$C: (0, 0)$$

$$p = 4$$

$$4p = 16$$

$$11. \text{ Focus } (0, 3\sqrt{3}); \text{ directrix } y = -3\sqrt{3}$$



$$\curvearrowleft +x^2$$

$$p = 3\sqrt{3}$$

$$4p = 12\sqrt{3}$$

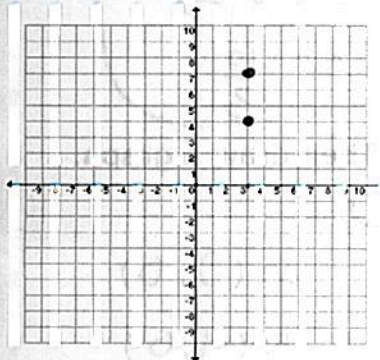
Equation:

$$y^2 = 16x$$

Equation:

$$x^2 = 12\sqrt{3}y$$

$$12. \text{ Focus } (3, 4); \text{ vertex } (3, 7)$$

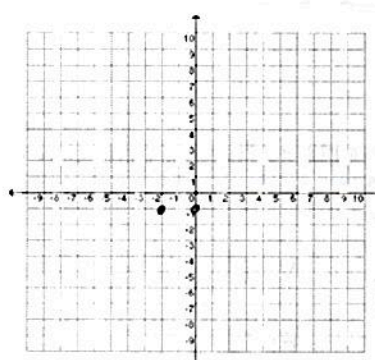


$$\curvearrowleft -x^2$$

$$p = 3$$

$$4p = 12$$

$$13. \text{ Focus } (-2, -1); \text{ vertex } (0, -1)$$



$$\curvearrowright -y^2$$

$$p = 2$$

$$4p = 8$$

Equation:

$$(x - 3)^2 = -12(y - 7)$$

Equation:

$$(y + 1)^2 = -8x$$