# Practice

A New Look at Parabolas

Write an equation of a parabola with vertex at the origin and the given focus.

1. focus at $(-2, 0)$ $x = -\frac{1}{8}y^2$ **2.** focus at $(0, 4)$ $y = \frac{1}{16}x^2$ **3.** focus at $(0, -3)$ $y = -\frac{1}{12}x^2$

4. focus at $(3, 0)$ $x = \frac{1}{12}y^2$ **5.** focus at $(-5, 0)$ $x = -\frac{1}{20}y^2$ **6.** focus at $(0, 5)$ $y = \frac{1}{20}x^2$

Identify the vertex, the focus, and the directrix of the parabola with the given equation. Then sketch the graph of the parabola.
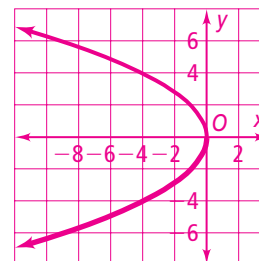
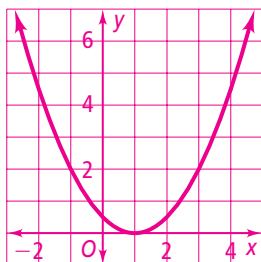**7.** $y = \frac{1}{12}x^2$

(0, 0); (0, 3);
$y = -3$
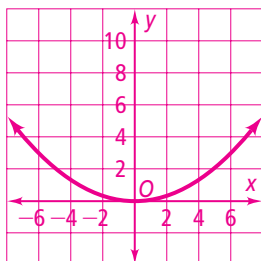
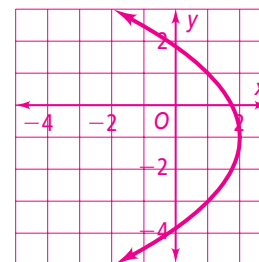**8.** $x = -\frac{1}{4}y^2$

(0, 0); (−1, 0);
$x = 1$

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

(1, 0); $\left(1, \frac{1}{2}\right)$;

$y = -\frac{1}{2}$

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

(2, −1); (1, −1);
$x = 3$

Write an equation of a parabola with vertex at the origin and the given directrix.

11. directrix $x = 3$ $x = -\frac{1}{12}y^2$ **12.** directrix $y = 4$ $y = -\frac{1}{16}x^2$ **13.** directrix $x = -2$ $x = \frac{1}{8}y^2$

14. directrix $y = -3$ $y = \frac{1}{12}x^2$ **15.** directrix $x = 6$ $x = -\frac{1}{24}y^2$ **16.** directrix $y = -7$ $y = \frac{1}{28}x^2$

17. The center of a pipe with a diameter of 0.5 in. is located 10 in. from a mirror with a parabolic cross section used as a solar collector. The center of the pipe is at the focus of the parabola.
   a. Write an equation to model the cross section of the mirror. $y = \frac{1}{40}x^2$
   b. The pipe receives 25 times more sunlight than it would without the mirror. The amount of light collected by the mirror is directly proportional to its diameter. Find the width of the mirror. **12.5 in.**

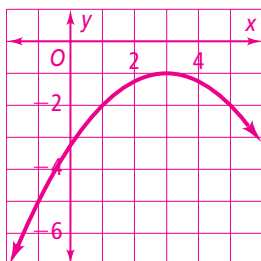# Practice (continued) Form G

A New Look at Parabolas

Identify the vertex, the focus, and the directrix of the parabola with the given equation. Then sketch the graph of the parabola.
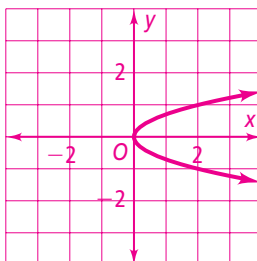
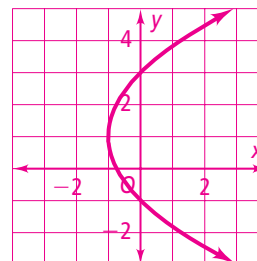**18.** $y + 1 = -\frac{1}{4}(x - 3)^2$

$(3, -1); (3, -2); y = 0$

19. $x = 2y^2$

$(0, 0); \left(\frac{1}{8}, 0\right); x = -\frac{1}{8}$

20. $y^2 - 4x - 2y = 3$

$(-1, 1); (0, 1); x = -2$

Write an equation of a parabola with the given vertex and focus.

21. vertex $(0, 0)$; focus $(-2, 0)$ $x = -\frac{1}{8}y^2$

22. vertex $(0, 0)$; focus $(0, 4)$ $y = \frac{1}{16}x^2$

23. vertex $(2, 3)$; focus $(6, 3)$ $x = \frac{1}{16}(y - 3)^2 + 2$

24. vertex $(4, 7)$; focus $(4, 4)$ $y = -\frac{1}{12}(x - 4)^2 + 7$

25. vertex $(5, 2)$; focus $(5, 9)$ $y = \frac{1}{28}(x - 5)^2 + 2$

26. vertex $(2, 9)$; focus $(3, 9)$ $x = \frac{1}{4}(y - 9)^2 + 2$

27. Writing What is the relationship between the focus of a parabola and the directrix of a parabola?

A parabola is the set of all points in a plane the same distance from a fixed line (directrix) and fixed point not on the line (focus). The focus and directrix define the parabola.

28. Open-Ended Write an equation for a horizontal parabola and an equation for a vertical parabola.

Answers may vary. The equation for a horizontal parabola should be in the form $x = ay^2$ while the equation for a vertical parabola should be in the form $y = ax^2$.

29. Error Analysis A student writes the equation of a parabola with vertex $(5, -7)$ and focus $(5, 3)$ as $x = \frac{1}{40}(x - 5)^2 + 7$. Is this correct? Why or why not?

This is the incorrect equation for the parabola because it begins with x, and the sign for 7 is incorrect. The correct equation is $y = \frac{1}{40}(x - 5)^2 - 7$.

30. Reasoning How can you find the value for c for the parabola $x = \frac{1}{10}(y + 6)^2 + 2$?

The value of $c = 2.5$ because $\frac{1}{4c} = \frac{1}{10}$ so $c = 2.5$.