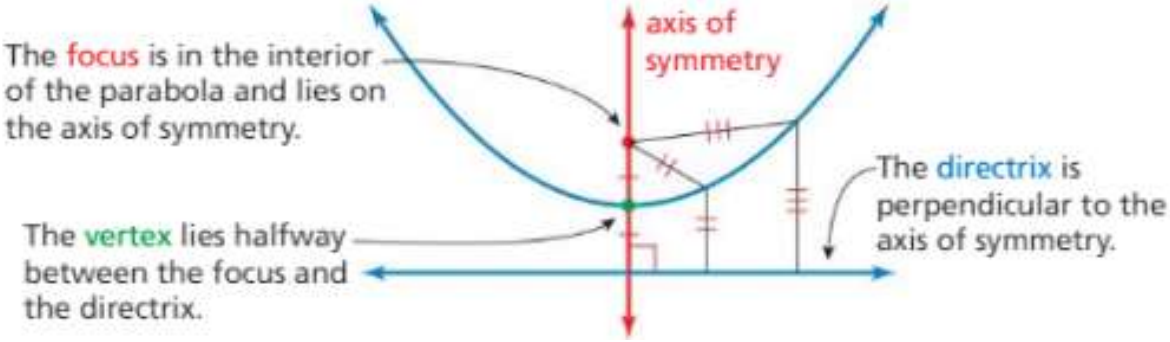
Chapter 2
Quadratic Functions

Section 2-3
Focus of a Parabola

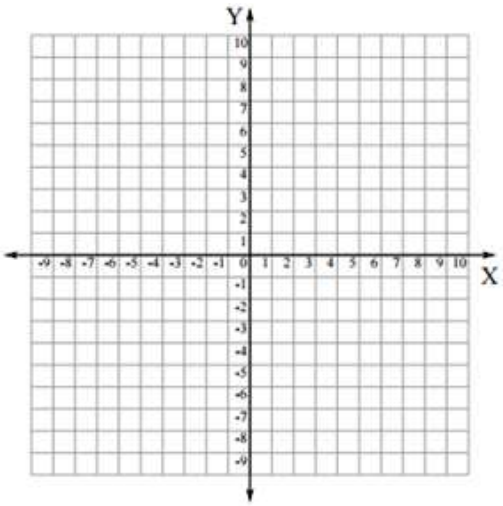
Exploring the Focus and Directrix

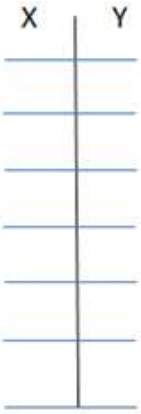
Previously, you learned that the graph of a quadratic function is a parabola that opens up or down. A parabola can also be defined as the set of all points (x, y) in a plane that are equidistant from a fixed point called the **focus** and a fixed line called the **directrix**.



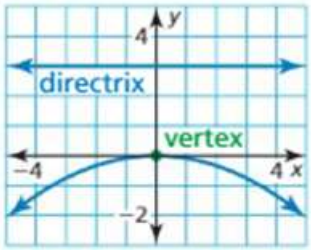
EXAMPLE 2 **Graphing an Equation of a Parabola**

Identify the focus, directrix, and axis of symmetry of $-4x = y^2$. Graph the equation.





EXAMPLE 3 Writing an Equation of a Parabola



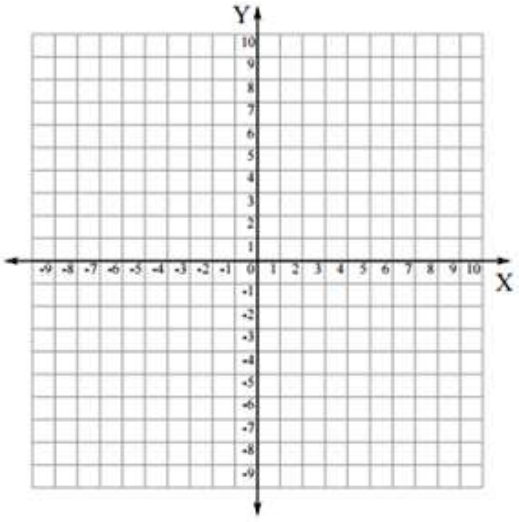
Write an equation of the parabola shown.

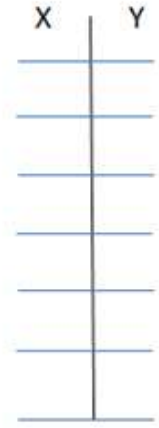
Identify the focus, directrix, and axis of symmetry of the parabola. Then graph the equation.

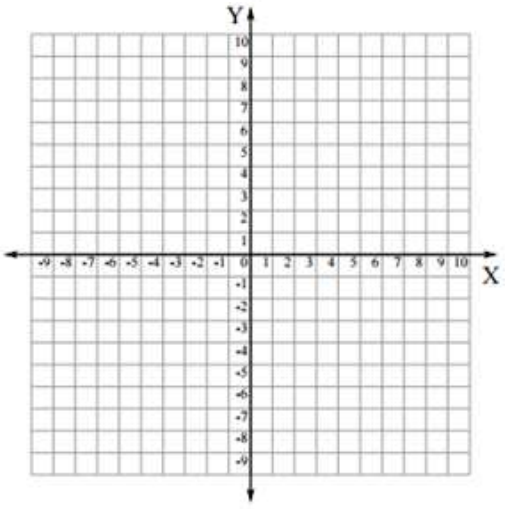
2. $y = 0.5x^2$

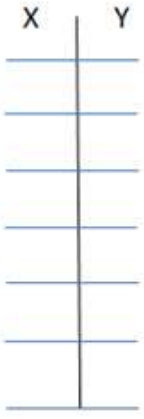
3. $-y = x^2$

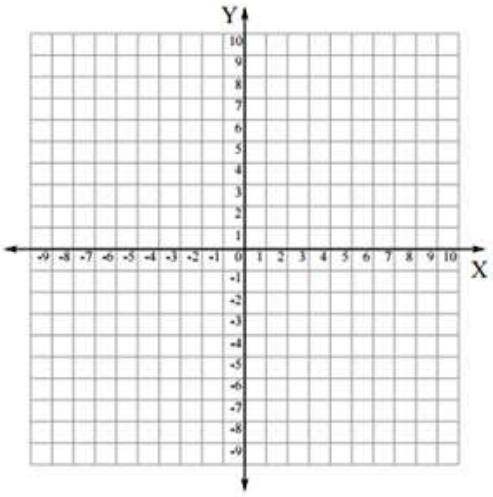
4. $y^2 = 6x$









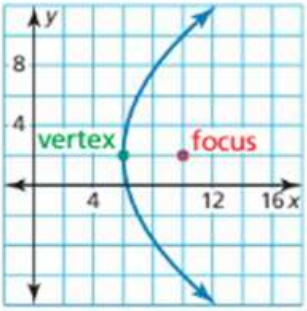


Write an equation of the parabola with vertex at (0, 0) and the given directrix or focus.

5. directrix: $x = -3$ **6.** focus: $(-2, 0)$ **7.** focus: $\left(0, \frac{3}{2}\right)$

EXAMPLE 4 Writing an Equation of a Translated Parabola

Write an equation of the parabola shown.



8. Write an equation of a parabola with vertex $(-1, 4)$ and focus $(-1, 2)$.

Solving Real-Life Problems

Parabolic reflectors have cross sections that are parabolas. Incoming sound, light, or other energy that arrives at a parabolic reflector parallel to the axis of symmetry is directed to the focus (Diagram 1). Similarly, energy that is emitted from the focus of a parabolic reflector and then strikes the reflector is directed parallel to the axis of symmetry (Diagram 2).

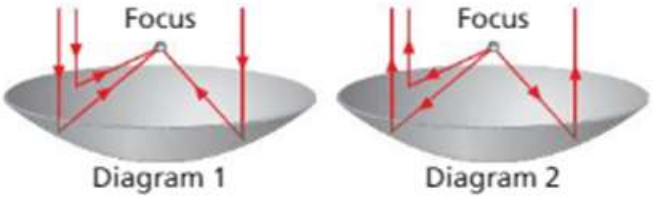
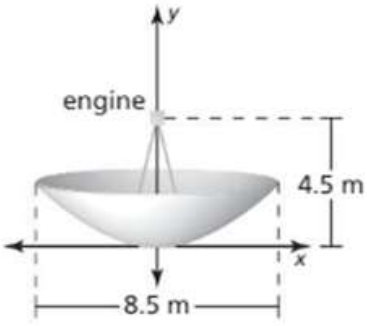


Diagram 1 Diagram 2

EXAMPLE 5 **Solving a Real-Life Problem**

An electricity-generating dish uses a parabolic reflector to concentrate sunlight onto a high-frequency engine located at the focus of the reflector. The sunlight heats helium to 650°C to power the engine. Write an equation that represents the cross section of the dish shown with its vertex at (0, 0). What is the depth of the dish?



Section 2-3 Homework #13-39odd