GUIDED PRACTICE for Examples 1 and 2

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

1. $y^2 = -6x$ **2.** $x^2 = 2y$ **3.** $y = -\frac{1}{4}x^2$ **4.** $x = \frac{1}{3}y^2$

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

5. Directrix: $y = 2$ **6.** Directrix: $x = 4$ **7.** Focus: $(-2, 0)$ **8.** Focus: $(0, 3)$

PARABOLIC REFLECTORS *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).

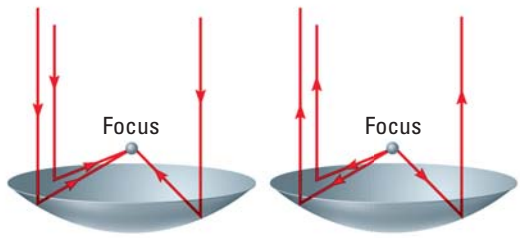
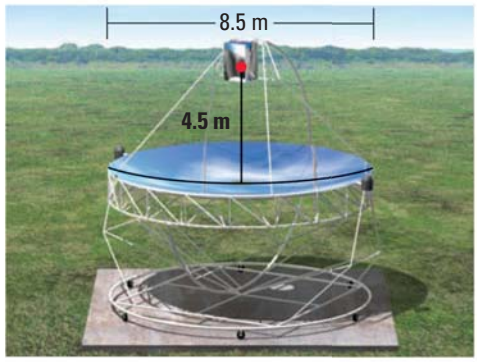


Diagram 1 Diagram 2

EXAMPLE 3 TAKS REASONING: Multi-Step Problem

SOLAR ENERGY The EuroDish, developed to provide electricity in remote areas, uses a parabolic reflector to concentrate sunlight onto a high-efficiency engine located at the reflector's focus. The sunlight heats helium to 650°C to power the engine.



- Write an equation for the EuroDish's cross section with its vertex at (0, 0).
- How deep is the dish?

Solution

STEP 1 **Write** an equation for the cross section. The engine is at the focus, which is $|p| = 4.5$ meters from the vertex. Because the focus is above the vertex, p is positive, so $p = 4.5$. An equation for the cross section of the EuroDish with its vertex at the origin is as follows:

$x^2 = 4py$ **Standard form, vertical axis of symmetry**

$x^2 = 4(4.5)y$ **Substitute 4.5 for *p*.**

$x^2 = 18y$ **Simplify.**

STEP 2 **Find** the depth of the EuroDish. The depth is the y-value at the dish's outside edge. The dish extends $\frac{8.5}{2} = 4.25$ meters to either side of the vertex (0, 0), so substitute 4.25 for x in the equation from Step 1.

$x^2 = 18y$ **Equation for the cross section**

$(4.25)^2 = 18y$ **Substitute 4.25 for *x*.**

$1.0 \approx y$ **Solve for *y*.**

▶ The dish is about 1 meter deep.