

38. **TAKS REASONING** What is an equation of the parabola with focus at  $(-8, 0)$  and vertex at  $(0, 0)$ ?
- (A)  $y^2 = -32x$       (B)  $y^2 = -0.5x$       (C)  $x^2 = -8y$       (D)  $x^2 = -32y$

**WRITING EQUATIONS** Write the standard form of the equation of the parabola with the given directrix and vertex at  $(0, 0)$ .

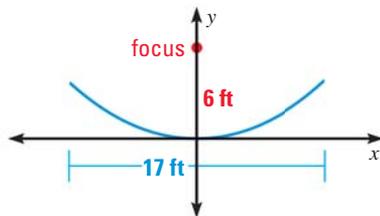
39.  $x = 3$       40.  $y = -7$       41.  $x = -5$       42.  $y = 12$   
 43.  $y = -4$       44.  $x = -2$       45.  $y = 6$       46.  $x = 11$   
 47.  $x = -\frac{3}{2}$       48.  $y = \frac{5}{12}$       49.  $y = -\frac{11}{6}$       50.  $x = -\frac{1}{18}$

51. **TAKS REASONING** Predict how the indicated change in  $a$  will affect the focus, directrix, and shape of the given equation's graph. Then graph both the original and revised equations in the same coordinate plane.
- a.  $x^2 = ay$ ;  $a$  changes from 1 to 4      b.  $y^2 = ax$ ;  $a$  changes from 6 to  $-\frac{1}{2}$
52. **WRITING** Suppose that  $x^2 = 4py$  and  $y = ax^2$  represent the same parabola. Explain how  $a$  and  $p$  are related.
53. **VISUAL THINKING** As  $|p|$  increases, how does the width of the graph of  $x^2 = 4py$  change? Explain.
54. **CHALLENGE** Consider the parabola with focus  $(0, p)$  and directrix  $y = -p$ . Let  $(x, y)$  be any point on the parabola. Use the fact that  $(x, y)$  is equidistant from the focus and directrix to show that  $x^2 = 4py$ .

## PROBLEM SOLVING

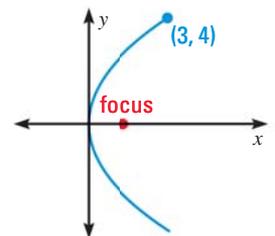
**EXAMPLE 3**  
 on p. 622  
 for Exs. 55–59

55. **SOLAR ENERGY** Solar energy can be concentrated using long troughs that have a parabolic cross section. The collected energy's uses include heating buildings, producing electricity, and producing fresh water from seawater. Write an equation for the cross section of the trough shown. How deep is it?



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56. **BIOLOGY** Scientists studying dolphin *echolocation* can simulate the projection of a dolphin's clicking sounds using computer models. The models originate the sounds at the focus of a parabolic reflector. The parabola in the graph models the cross section (with units in inches) of the reflector used to simulate sound projection for a bottlenose dolphin. What is the *focal length* (the distance from the vertex to the focus)?



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