

## 2.3 Solving Radical Equations Graphically

### KEY IDEAS

#### Strategy for Solving Algebraically

**Step 1:** List any restrictions for the variable. You cannot take the square root of a negative number, so the value of the variable must be such that any operations under the radical sign result in a positive value.

**Step 2:** Isolate the radical and square both sides of the equation to eliminate the radical. Then, solve for  $x$ .

**Step 3:** Find the roots of the equation (that is, the value(s) of  $x$  that make the equation have a value of zero).

**Step 4:** Check the solution, ensuring that it does not contain *extraneous roots* (solutions that do not satisfy the original equation or restrictions when substituted in the original equation).

#### Example:

$$7 = \sqrt{12 - x} + 4, x \leq 12 \quad \text{Identify restrictions.}$$

$$3 = \sqrt{12 - x} \quad \text{Isolate the radical.}$$

$$3^2 = (\sqrt{12 - x})^2 \quad \text{Square both sides.}$$

$$9 = 12 - x \quad \text{Solve for } x.$$

$$3 = x$$

Check:

Solution meets the restrictions.

$$7 = \sqrt{12 - 3} + 4$$

$$7 = \sqrt{9} + 4$$

$$7 = 7$$

#### Strategies for Solving Graphically

##### • Method 1: Graph a Single Equation

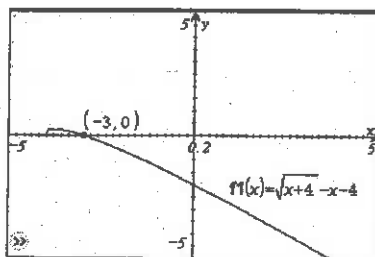
Graph the corresponding function and find the zero(s) of the function.

##### Example:

$$2 + \sqrt{x + 4} = x + 6$$

$$\sqrt{x + 4} - x - 4 = 0$$

Graph  $y = \sqrt{x + 4} - x - 4$ .



$$x = -3$$

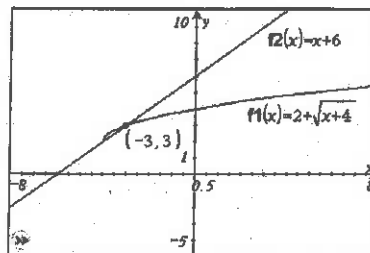
##### • Method 2: Graph Two Equations

Graph each side of the equation on the same grid, and find the point(s) of intersection.

##### Example:

$$2 + \sqrt{x + 4} = x + 6$$

Graph  $y = 2 + \sqrt{x + 4}$  and  $y = x + 6$ .



$$x = -3$$