## EXAMPLE 2 Solve a trigonometric equation in an interval

**Solve $9\tan^2 x + 2 = 3$ in the interval $0 \le x < 2\pi$.**

$9\tan^2 x + 2 = 3$ — Write original equation.

$9\tan^2 x = 1$ — Subtract 2 from each side.

$\tan^2 x = \frac{1}{9}$ — Divide each side by 9.

$\tan x = \pm\frac{1}{3}$ — Take square roots of each side.

**REVIEW INVERSE FUNCTIONS**
For help with inverse trigonometric functions, see p. 875.

Using a calculator, you find that $\tan^{-1}\frac{1}{3} \approx 0.322$ and $\tan^{-1}\left(-\frac{1}{3}\right) \approx -0.322$. Therefore, the general solution of the equation is:

$x \approx 0.322 + n\pi$ or $x \approx -0.322 + n\pi$ (where $n$ is any integer)

▶ The specific solutions in the interval $0 \le x < 2\pi$ are:

$x \approx 0.322$ $\quad$ $x \approx -0.322 + \pi \approx 2.820$

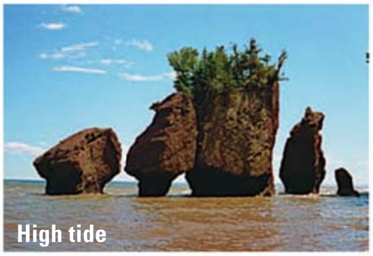
$x \approx 0.322 + \pi \approx 3.464$ $\quad$ $x \approx -0.322 + 2\pi \approx 5.961$

## EXAMPLE 3 Solve a real-life trigonometric equation

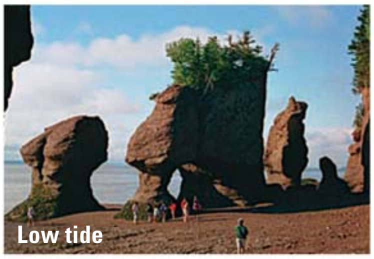
**OCEANOGRAPHY** The water depth $d$ for the Bay of Fundy can be modeled by

$$d = 35 - 28\cos\frac{\pi}{6.2}t$$

where $d$ is measured in feet and $t$ is the time in hours. If $t = 0$ represents midnight, at what time(s) is the water depth 7 feet?



High tide



Low tide

**ANOTHER WAY**
For alternative methods for solving the problem in Example 3, turn to page 938 for the **Problem Solving Workshop**.

### Solution

Substitute 7 for $d$ in the model and solve for $t$.

$35 - 28\cos\frac{\pi}{6.2}t = 7$ — Substitute 7 for $d$.

$-28\cos\frac{\pi}{6.2}t = -28$ — Subtract 35 from each side.

$\cos\frac{\pi}{6.2}t = 1$ — Divide each side by −28.

$\frac{\pi}{6.2}t = 2n\pi$ — $\cos\theta = 1$ when $\theta = 2n\pi$.

$t = 12.4n$ — Solve for $t$.

▶ On the interval $0 \le t \le 24$ (representing one full day), the water depth is 7 feet when $t = 12.4(0) = 0$ (that is, at midnight) and when $t = 12.4(1) = 12.4$ (that is, at 12:24 P.M.).