

**EXAMPLE 5** TAKS PRACTICE: Multiple Choice

One zero of $f(x) = x^3 - 5x^2 - 12x + 36$ is $x = 2$. What is another zero of f ?

- (A) -6 (B) -3 (C) -2 (D) 3

Solution

Because $f(2) = 0$, $x - 2$ is a factor of $f(x)$. Use synthetic division.

$$\begin{array}{r|rrrr} 2 & 1 & -5 & -12 & 36 \\ & & 2 & -6 & -36 \\ \hline & 1 & -3 & -18 & 0 \end{array}$$

Use the result to write $f(x)$ as a product of two factors. Then factor completely.

$$f(x) = x^3 - 5x^2 - 12x + 36 = (x - 2)(x^2 - 3x - 18) = (x - 2)(x + 3)(x - 6)$$

The zeros are 2, -3, and 6.

► The correct answer is B. (A) (B) (C) (D)

EXAMPLE 6 Use a polynomial model

BUSINESS The profit P (in millions of dollars) for a shoe manufacturer can be modeled by $P = -21x^3 + 46x$ where x is the number of shoes produced (in millions). The company now produces 1 million shoes and makes a profit of \$25,000,000, but would like to cut back production. What lesser number of shoes could the company produce and still make the same profit?

**Solution**

$$25 = -21x^3 + 46x \quad \text{Substitute 25 for } P \text{ in } P = -21x^3 + 46x.$$

$$0 = 21x^3 - 46x + 25 \quad \text{Write in standard form.}$$

You know that $x = 1$ is one solution of the equation. This implies that $x - 1$ is a factor of $21x^3 - 46x + 25$. Use synthetic division to find the other factors.

$$\begin{array}{r|rrrr} 1 & 21 & 0 & -46 & 25 \\ & & 21 & 21 & -25 \\ \hline & 21 & 21 & -25 & 0 \end{array}$$

So, $(x - 1)(21x^2 + 21x - 25) = 0$. Use the quadratic formula to find that $x \approx 0.7$ is the other positive solution.

► The company could still make the same profit producing about 700,000 shoes.

GUIDED PRACTICE for Examples 5 and 6

Find the other zeros of f given that $f(-2) = 0$.

7. $f(x) = x^3 + 2x^2 - 9x - 18$ 8. $f(x) = x^3 + 8x^2 + 5x - 14$

9. **WHAT IF?** In Example 6, how does the answer change if the profit for the shoe manufacturer is modeled by $P = -15x^3 + 40x$?