

## EXAMPLE 6 Approximate real zeros of a polynomial model

**TACHOMETER** A tachometer measures the speed (in revolutions per minute, or RPMs) at which an engine shaft rotates. For a certain boat, the speed  $x$  of the engine shaft (in 100s of RPMs) and the speed  $s$  of the boat (in miles per hour) are modeled by

$$s(x) = 0.00547x^3 - 0.225x^2 + 3.62x - 11.0$$

What is the tachometer reading when the boat travels 15 miles per hour?



### Solution

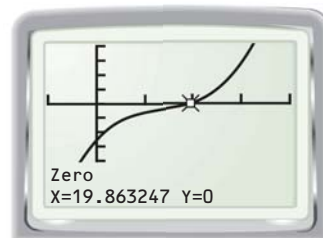
Substitute 15 for  $s(x)$  in the given function. You can rewrite the resulting equation as:

$$0 = 0.00547x^3 - 0.225x^2 + 3.62x - 26.0$$

Then, use a graphing calculator to approximate the real zeros of  $f(x) = 0.00547x^3 - 0.225x^2 + 3.62x - 26.0$ .

From the graph, there is one real zero:  $x \approx 19.9$ .

► The tachometer reading is about 1990 RPMs.



## ✓ GUIDED PRACTICE for Examples 5 and 6

- Approximate the real zeros of  $f(x) = 3x^5 + 2x^4 - 8x^3 + 4x^2 - x - 1$ .
- WHAT IF?** In Example 6, what is the tachometer reading when the boat travels 20 miles per hour?

## 5.7 EXERCISES

### HOMWORK KEY

○ = **WORKED-OUT SOLUTIONS**  
on p. WS1 for Exs. 15, 37, and 61

✶ = **TAKS PRACTICE AND REASONING**  
Exs. 9, 33, 51, 52, 63, 64, 66, and 67

### SKILL PRACTICE

- VOCABULARY** Copy and complete: For the equation  $(x - 1)^2(x + 2) = 0$ , a(n) ? solution is 1 because the factor  $x - 1$  appears twice.
- WRITING** Explain the difference between complex conjugates and irrational conjugates.

### NUMBER OF SOLUTIONS OR ZEROS Identify the number of solutions or zeros.

- $x^4 + 2x^3 - 4x^2 + x - 10 = 0$
- $5y^3 - 3y^2 + 8y = 0$
- $9t^6 - 14t^3 + 4t - 1 = 0$
- $f(z) = -7z^4 + z^2 - 25$
- $g(s) = 12s^7 - 9s^6 + 4s^5 - s^3 - 20s + 50$
- $h(x) = -x^{12} + 7x^8 + 5x^4 - 8x + 6$
- TAKS PRACTICE AND REASONING** How many zeros does the function  $f(x) = 16x - 22x^3 + 6x^6 + 19x^5 - 3$  have?

- (A) 1                      (B) 3                      (C) 5                      (D) 6

### EXAMPLE 1

on p. 379  
for Exs. 3–9