GUIDED PRACTICE for Example 3

Find all real zeros of the function.

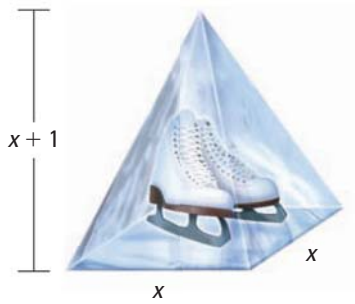
5. $f(x) = 48x^3 + 4x^2 - 20x + 3$

6. $f(x) = 2x^4 + 5x^3 - 18x^2 - 19x + 42$

TAKS

EXAMPLE 4 TAKS REASONING: Multi-Step Problem

ICE SCULPTURES Some ice sculptures are made by filling a mold with water and then freezing it. You are making such an ice sculpture for a school dance. It is to be shaped like a pyramid with a height that is 1 foot greater than the length of each side of its square base. The volume of the ice sculpture is 4 cubic feet. What are the dimensions of the mold?



Solution

STEP 1 **Write** an equation for the volume of the ice sculpture.

$$\underset{\text{(cubic feet)}}{\text{Volume}} = \frac{1}{3} \cdot \underset{\text{(square feet)}}{\text{Area of base}} \cdot \underset{\text{(feet)}}{\text{Height}}$$

$$4 = \frac{1}{3} \cdot x^2 \cdot (x + 1)$$

$4 = \frac{1}{3}x^2(x + 1)$ **Write equation.**

$12 = x^3 + x^2$ **Multiply each side by 3 and simplify.**

$0 = x^3 + x^2 - 12$ **Subtract 12 from each side.**

STEP 2 **List** the possible rational solutions: $\pm\frac{1}{1}, \pm\frac{2}{1}, \pm\frac{3}{1}, \pm\frac{4}{1}, \pm\frac{6}{1}, \pm\frac{12}{1}$

STEP 3 **Test** possible solutions. Only positive x-values make sense.

1	1	1	0	−12
		1	2	2
	1	2	2	**−10**

2	1	1	0	−12
		2	6	12
	1	3	6	**0**

2 is a solution.

STEP 4 **Check** for other solutions. The other two solutions, which satisfy $x^2 + 3x + 6 = 0$, are $x = \frac{-3 \pm i\sqrt{15}}{2}$ and can be discarded because they are imaginary numbers.

▶ The only reasonable solution is $x = 2$. The base of the mold is 2 feet by 2 feet. The height of the mold is $2 + 1 = 3$ feet.

GUIDED PRACTICE for Example 4

7. **WHAT IF?** In Example 4, suppose the base of the ice sculpture has sides that are 1 foot longer than the height. The volume of the ice sculpture is 6 cubic feet. What are the dimensions of the mold?