GUIDED PRACTICE for Example 4

Tell whether the lines are *parallel*, *perpendicular*, or *neither*.

11. Line 1: through $(-2, 8)$ and $(2, -4)$
Line 2: through $(-5, 1)$ and $(-2, 2)$

12. Line 1: through $(-4, -2)$ and $(1, 7)$
Line 2: through $(-1, -4)$ and $(3, 5)$

REVIEW RATES
Remember that a *rate* is a ratio of two quantities that have *different* units.

RATE OF CHANGE Slope can be used to represent an average **rate of change**, or how much one quantity changes, on average, relative to the change in another quantity. A slope that is a real-life rate of change involves units of measure such as miles per hour or degrees per day.

EXAMPLE 5 TAKS REASONING: Multi-Step Problem

FORESTRY Use the diagram, which illustrates the growth of a giant sequoia, to find the average rate of change in the diameter of the sequoia over time. Then predict the sequoia's diameter in 2065.

Solution

STEP 1 **Find** the average rate of change.

$$\text{Average rate of change} = \frac{\text{Change in diameter}}{\text{Change in time}}$$

$$= \frac{141 \text{ in.} - 137 \text{ in.}}{2005 - 1965}$$

$$= \frac{4 \text{ in.}}{40 \text{ years}}$$

$$= \mathbf{0.1} \text{ inch per year}$$

STEP 2 **Predict** the diameter of the sequoia in 2065.

Find the number of years from 2005 to 2065. Multiply this number by the average rate of change to find the total increase in diameter during the period 2005–2065.

Number of years $= 2065 - 2005 = \mathbf{60}$
Increase in diameter $= (\mathbf{60} \text{ years})(\mathbf{0.1} \text{ inch/year}) = 6$ inches

▶ In 2065, the diameter of the sequoia will be about $141 + 6 = 147$ inches.

GUIDED PRACTICE for Example 5

13. WHAT IF? In Example 5, suppose that the diameter of the sequoia is 248 inches in 1965 and 251 inches in 2005. Find the average rate of change in the diameter, and use it to predict the diameter in 2105.