

## Exercise 44

For the following exercises, use the median home values in Indiana and Alabama (adjusted for inflation) shown in Table 3. Assume that the house values are changing linearly.

| Year | Indiana  | Alabama  |
|------|----------|----------|
| 1950 | \$37,700 | \$27,100 |
| 2000 | \$94,300 | \$85,100 |

**Table 3**

If we assume the linear trend existed before 1950 and continues after 2000, the two states' median house values will be (or were) equal in what year? (The answer might be absurd.)

### Solution

Start by writing an equation of the home price in each state. Let  $t$  be the number of years after 1950, and let  $P_I$  and  $P_A$  be the median prices in Indiana and Alabama, respectively. When  $t = 0$ ,  $P_I = 37\,700$ , and when  $t = 50$ ,  $P_I = 94\,300$ :  $(0, 37\,700)$  and  $(50, 94\,300)$ . When  $t = 0$ ,  $P_A = 27\,100$ , and when  $t = 50$ ,  $P_A = 87\,100$ :  $(0, 27\,100)$  and  $(50, 87\,100)$ . Find the slope of the Indiana line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{94\,300 - 37\,700}{50 - 0} = \frac{56\,600}{50} = 1132$$

Now use the point-slope formula with either of the two points to get the equation of the Indiana line.

$$P_I - 37\,700 = 1132(t - 0)$$

$$P_I - 37\,700 = 1132t$$

$$P_I = 1132t + 37\,700$$

Find the slope of the Alabama line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{87\,100 - 27\,100}{50 - 0} = \frac{60\,000}{50} = 1200$$

Now use the point-slope formula with either of the two points to get the equation of the Alabama line.

$$P_A - 27\,100 = 1200(t - 0)$$

$$P_A - 27\,100 = 1200t$$

$$P_A = 1200t + 27\,100$$

Set the prices equal to each other and solve for the time.

$$P_I = P_A$$

$$1132t + 37\,700 = 1200t + 27\,100$$

$$1132t - 1200t = 27\,100 - 37\,700$$

$$-68t = -10\,600$$

$$y = \frac{10\,600}{68} = \frac{2650}{17} \approx 155.88$$

Therefore, the median home prices in Indiana and Alabama are equal about 156 years after 1950, or at the end of 2105.