Exercise 41

For the following exercises, use the median home values in Mississippi and Hawaii (adjusted for inflation) shown in Table 2. Assume that the house values are changing linearly.

Year	Mississippi	Hawaii
1950	$25,200	$74,400
2000	$71,400	$272,700

Table 2

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_M and P_H be the median prices in Mississippi and Hawaii, respectively. When $t = 0$, $P_M = 25\,200$, and when $t = 50$, $P_M = 71\,400$: $(0, 25\,200)$ and $(50, 71\,400)$. When $t = 0$, $P_H = 74\,400$, and when $t = 50$, $P_H = 272\,700$: $(0, 74\,400)$ and $(50, 272\,700)$. Find the slope of the Mississippi line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{71\,400 - 25\,200}{50 - 0} = \frac{46\,200}{50} = 924$$

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

$$P_M - 25\,200 = 924(t - 0)$$

$$P_M - 25\,200 = 924t$$

$$P_M = 924t + 25\,200$$

Find the slope of the Hawaii line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{272\,700 - 74\,400}{50 - 0} = \frac{198\,300}{50} = 3966$$

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

$$P_H - 74\,400 = 3966(t - 0)$$

$$P_H - 74\,400 = 3966t$$

$$P_H = 3966t + 74\,400$$

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

$$P_M = P_H$$

$$924t + 25\,200 = 3966t + 74\,400$$

$$924t - 3966t = 74\,400 - 25\,200$$

$$-3042t = 49\,200$$

$$y = -\frac{49\,200}{3042} = -\frac{8200}{507} \approx -16.2$$

Therefore, the median home prices in Mississippi and Hawaii are equal about 16 years prior to 1950, or at the end of 1933.