

1.6.87 Population Growth

The population of Merbrook is 375,000 and is increasing at the rate of 0.225% per year. Predict when the population will be 1 million.

Solution

Well, the model for such population growth is $y = y_0 e^{kt}$.

Here $k = 0.225\% = 0.00225$

$y_0 = 375,000$, and t is time in years measured from "NOW." In the model here is

$$y = 375,000 e^{0.00225t}$$

The question is, $t = ?$ when $y = 1,000,000$.

This gives

$$1,000,000 = 375,000 e^{0.00225t} \quad (\text{substit}),$$

$$\text{or } \frac{1,000,000}{375,000} = \frac{1000}{375} = e^{0.00225t}$$

$$\text{or } \ln\left(\frac{1000}{375}\right) = \ln\left(e^{0.00225t}\right) = 0.00225t$$

$$\text{or } \boxed{t = \frac{\ln\left(\frac{1000}{375}\right)}{0.00225}} \approx 43.95 \text{ years. } \square$$