

Depreciation The value V of a Honda Civic DX that is t years old can be modeled by¹

$$V(t) = 16,775(0.905)^t$$

- (a) According to the model, when will the car be worth \$15,000?
- (b) According to the model, when will the car be worth \$8000?
- (c) According to the model, when will the car be worth \$4000?

Since all three questions are the same type, we'll solve the function for t in terms of V , and then respond to the questions.

$$\begin{aligned} V &= 16,775(0.905)^t \\ \frac{V}{16,775} &= 0.905^t \\ \ln\left(\frac{V}{16,775}\right) &= \ln(0.905^t) \\ \ln\left(\frac{V}{16,775}\right) &= t \cdot \ln(0.905) \\ \frac{\ln\left(\frac{V}{16,775}\right)}{\ln(0.905)} &= t \end{aligned}$$

Now we'll answer the questions.

- (a) According to the model, when will the car be worth \$15,000?

$$\begin{aligned} t &= \frac{\ln\left(\frac{15,000}{16,775}\right)}{\ln(0.905)} \\ t &\approx 1.1 \end{aligned}$$

Thus in about 1.1 years, the value of the Honda will be \$15,000.

- (b) According to the model, when will the car be worth \$8000?

$$\begin{aligned} t &= \frac{\ln\left(\frac{8000}{16,775}\right)}{\ln(0.905)} \\ t &\approx 7.4 \end{aligned}$$

Thus in about 7.4 years, the value of the Honda will be \$8000.

- (c) According to the model, when will the car be worth \$4000?

$$\begin{aligned} t &= \frac{\ln\left(\frac{4000}{16,775}\right)}{\ln(0.905)} \\ t &\approx 14.4 \end{aligned}$$

Thus in about 14.4 years, the value of the Honda will be \$4000.

¹Sullivan, *Precalculus: Enhanced with Graphing Utilities*, p. 317, #100.