

Monthly sales of a Blue Ray player are approximately

$$S(t) = 1000 - 750e^{-t} \text{ thousand units}$$

where  $t$  is the number of months the Blue Ray player has been on the market.

- a. Find the initial sales.

The initial sales occur at  $t = 0$ . The corresponding sales are

$$S(0) = 1000 - 750e^{-0} = 250 \text{ thousand units}$$

or 250,000 units.

- b. In how many months will sales reach 500,000 units?

Set  $S(t)$  equal to 500 and solve for  $t$ .

$$500 = 1000 - 750e^{-t}$$

$$-500 = -750e^{-t}$$

Subtract 1000 from both sides

$$\frac{-500}{-750} = e^{-t}$$

Divide both sides by -750

$$\frac{2}{3} = e^{-t}$$

Reduce the fraction

$$-t = \ln\left(\frac{2}{3}\right)$$

Convert the exponential form to logarithm form

$$t = -\ln\left(\frac{2}{3}\right) \approx 0.41 \text{ months}$$

Multiply both sides by -1 and evaluate the logarithm

- c. Will sales ever reach 1000 thousand units?

Follow steps similar to part b.

$$1000 = 1000 - 750e^{-t}$$

Set  $S(t)$  equal to 1000

$$0 = -750e^{-t}$$

Subtract 1000 from both sides

$$0 = e^{-t}$$

Divide both sides by -750

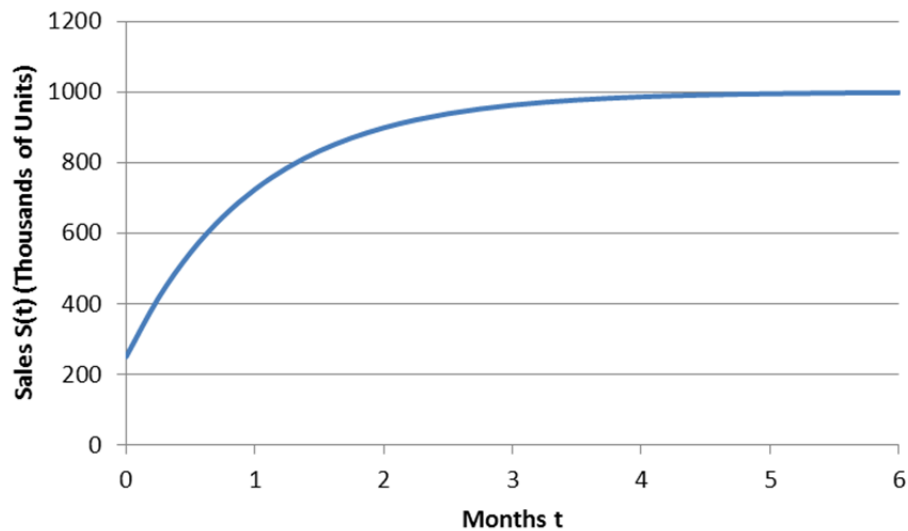
$$-t = \ln(0)$$

Convert the exponential form to logarithm form

Since the logarithm of zero is not defined, sales will never be 1000 thousand units.

d. Is there a limit for sales?

To help us answer this question, let's look at a graph of  $S(t)$ .



Examining the graph, it appears that the sales are getting closer and closer to 1000 units, but never quite get there (part c). So the limit for sales is 1000 thousand units or 1,000,000 units.