

6.4A Exponential Growth and Decay

Exponential Growth: $y = a(1 + r)^t$

Exponential Decay: $y = a(1 - r)^t$

$b > 1$

$0 < b < 1$

a = starting amount

r = rate (as a decimal)

t = time

$$y = ab^x$$

a = starting amount

b = what you are doing to your problem
(double, triple, etc)

x = time

Determine whether each function represents exponential growth or exponential decay. Identify the initial amount and the percent rate of change.

1. $y = 2(0.92)^t$

$$b < 1$$

Exponential
decay

initial amount = 2

8%

2. $f(t) = (1.2)^t$

$$b > 1$$

Exponential
growth

initial amount = 1

20%

1. The inaugural attendance of an annual music festival is 150,000.
The attendance y increases by 8% each year.

a. Write an exponential growth function that represents the attendance after t years.

$$y = 150000(1 + 0.08)^t \quad \frac{8}{100} = 0.08$$

$$y = 150000(1.08)^t$$

b. How many people will attend the festival in the fifth year? Round your answer to the nearest thousand.

$t = 4$ b/c $t = 0$
represents
the first
year

$$y = 150000(1.08)^4$$

$$y \approx 204,073 \text{ people}$$

2. A website has 500,000 members in 2010. The number y of members increases by 15% each year. a) Write an exponential growth function that represents the website membership t years after 2010. b) How many members will there be in 2016? Round your answer to the nearest ten thousand.

a)

$$y = 500000(1 + 0.15)^t$$

$$y = 500000(1.15)^t$$

$$\frac{15}{100} = 0.15$$

b)

$$y = 500000(1.15)^6$$

$$y \approx 1,156,530 \text{ people}$$

You buy a car for \$48,000 in 2018. If the value of the car depreciates at a rate of 8.25% each year, how much is your car worth in 2032?

$$y = 48000(1 - .0825)^t$$

$$\frac{8.25}{100} = .0825$$

$$y = 48000(.9175)^t$$

$$y = 48000(.9175)^{14}$$

$$\begin{array}{r} 2032 \\ -2018 \\ \hline 14 \text{ years} \end{array}$$

$$y = \$14,378.92$$

$$t = 14$$

A bacteria culture starts with 350 cells. If it triples every hour, how many cells are there after 4 hours?

$$a = 350$$

$$b = 3$$

$$x = 4$$

$$y = 350(3)^4$$

$$y = 28,350 \text{ cells}$$

Your friend gives you the options below. Which is a better deal?

Option 1: \$1500 per day for 3 weeks

3 weeks =
21 days

Option 2: Doubling a nickel each day for 3 weeks

$$b=2$$

$$a=.05$$

$$x=21$$

Option 1

$$1500 \times 21$$

$$= \$31,500$$

Option 2

$$y = (0.05)(2)^{21}$$

$$y = \$104,857.60$$

Option 2 is a better deal.

Homework

Pg. 319 #6 - 9, 13, 14, 17, 18, 27 - 30, 33, 34

