

## 8.8 Exponential Growth

To have an exponential function increase as we read the graph from left to right, we must have a "b" greater than 1.

Remember, if something grows, it is 100% of what it used to be, plus even more.

Suppose Shelby Junior High has 1342 students this year, and will continue to grow about 3.5% each year. What will be the student population 3 years from now?

x = years (time is almost always independent)

y = students (students depend on years and growth factor)

a = starting point (y-intercept at year 0)

b = growth factor

$$\text{So } y = 1342 \cdot 1.035^x$$

$$y = 1488 \text{ Students}$$

Plug in x = 3 and evaluate.

Page 1

In 1998, a certain town had a population of about 14,500 people. Since 1998, the population has increased about 1.4% a year. Write an equation and evaluate it to tell the population in 2010.

a = starting point (14,500)

b = growth factor (101.4%)

x = time

y = population

$$y = 14,500 (1.014)^x$$

$$y = 14,500 (1.014)^{12} = 17,133$$

Page 3

Page 2

Who doesn't like money?! Banks use exponential growth on a daily basis to make some money for their customers and lots of money for their bankers.

Suppose your parents deposited \$1500 in an account paying 8% interest compounded annually when you were born. Find the account balance after 18 years.

x = time

y = total money

a = initial money (at t = 0; your birth)

b = interest rate (plus 100% of the money that you keep in the account)

$$y = 1500 \cdot 1.08^x$$

$$y = \$5994.03$$

Page 4

Suppose you deposit \$100 in a college fund that pays 7.2% interest compounded annually. Find the account balance after 5 years.

$$a = \text{start} = 100$$

$$b = \text{growth} = 107.2\%$$

$$X = \text{time}$$

$$y = \text{account balance}$$

$$y = 100(1.072)^x$$

$$y = 100(1.072)^5 = \$141.57$$

Page 5

Annual interest rate is good, but compound is better. You get a smaller percentage each time, but you get paid more times a year. Always look for a bank that has compound interest rates.

Annual Interest Rate of 8%

Compounded	Periods per Year	Interest Rate per Period
annually	1	8% every year
semi-annually	2	$\frac{8\%}{2} = 4\%$ every 6 months
quarterly	4	$\frac{8\%}{4} = 2\%$ every 3 months
monthly	12	$\frac{8\%}{12} = 0.\bar{6}\%$ every month

Page 6

Suppose your parents deposited money in a bank that paid 8% quarterly interest instead. Look at how much more money you would have when you were 18.

x = time (times 4 because there are 4 quarters in a year!)

y = total balance

a = 1500

b = interest rate (divided by 4 because there are 4 quarters in a year.)

$$y = 1500 \left(1 + \frac{.08}{4}\right)^{4 \cdot 18}$$

$$y = 1500(1.02)^{72} = \$6241.71$$

Page 7

Suppose you deposit \$100 in an account that pays 7.2% interest compounded monthly. Find the account balance after 5 years.

$$a = \text{start} = 100$$

$$b = \text{growth} \frac{7.2\%}{12}$$

$$X = \text{time} \cdot 12$$

$$y = \text{balance}$$

$$y = 100 \left(1 + \frac{.072}{12}\right)^{12 \cdot 5} = 100(1.006)^{60} = \$143.17$$

Page 8