| Name: | Date: |
| Topic: | Class: |

Main Ideas/Questions	Notes/Examples

Exponential Growth

2nd ÷
gives % sign on calculator

Occurs when a **quantity exponentially increases** over time.

Formula:

$$y = a_0\left(1 + \%\right)^t \quad \text{or}$$

$$y = a_0\left(1 + r\right)^t$$

$a =$ _initial amount_

$r =$ _rate - given as %; change to decimal_

$t =$ _time (years)_

Examples

1. The original value of an investment is $1400, and the value <u>increases</u> by 9% each year. Use an exponential growth function to find the value of the investment after 25 years.

$a = 1400$
$r = 9\%$
$t = 25$

$1400\left(1 + 9\%\right)^{25} = 1400\left(1.09\right)^{25}$

$\$12,072.31$

2. The cost of tuition at a college is $12,000 and is <u>increasing</u> at a rate of 6% each year. Use an exponential function to find the tuition cost after 4 years.

$12000\left(1 + 6\%\right)^4 = 12000\left(1.06\right)^4$

$\$15149.72$ cost of tuition

3. The number of student athletes at a local high school is 300 and is <u>increasing</u> at a rate of 8% per year. Use an exponential function to find the number of student athletes after 5 years.

$300\left(1 + 8\%\right)^5 = 440.80$
$300\left(1.08\right)^5$

So 440 student athletes

4. Annual sales for a company are $149,999 and are <u>increasing</u> at a rate of 6% per year. Use an exponential function to find the annual sales after 7 years.

$149,999\left(1 + 6\%\right)^7 = 149,999\left(1.06\right)^7 =$

$\$225,543.04$

5. The population of a small town is 1600 and is <u>increasing</u> at a rate of 3% per year. Use an exponential function to find the population of the town after 10 years.

$1600\left(1 + 3\%\right)^{10} = 1600\left(1.03\right)^{10}$

2150.27 So 2150 people

6. In 1985, there were 285 cell phone subscribers in Mayville. The number of subscribers increased by 75% per year after 1985. Find the number of subscribers in 2008.

$285\left(1 + 75\%\right)^{23} = 285\left(175\%\right)^{23}$

110845988 subscribers

$\begin{array}{r} 2008 \\ -1985 \\ \hline 23 \end{array}$

Exponential Decay	Occurs when a **quantity exponentially decreases** over time.	
	Formula: $y = a_0(1-\%)^t$ or $y = a_0(1-r)^t$	$a =$ <u>initial amount</u> $r =$ <u>rate - given as a %</u> $t =$ <u>time (years)</u>

Examples

7. The population of a town is decreasing at a rate of 1% per year. In 2000 there were 1300 people. Use an exponential function to find the population in 2008.

$$1300\left(\underset{\text{or}}{1-1\%}\right)^8 = 1199.57$$
$$1300(0.99)^8$$

1199 population

8. The value of a car is $18,000 and <u>depreciating</u> at a rate of 12% per year. Use an exponential function to find the value of the car after 10 years.

$$18000\left(\underset{\text{or}}{1-12\%}\right)^{10} = \$5013.02$$
$$18000(0.88)^{10}$$

9. A farmer buys a tractor for $50,000. If the tractor <u>depreciates</u> 10% per year, use an exponential function to find the value of the tractor in 7 years.

$$50,000\left(\underset{\text{or}}{1-10\%}\right)^7 = \$23914.85$$
$$50000(.90)^7$$

10. An investment of $8200 loses value at a rate of 2% per year. Use an exponential function to find the value of the investment after 9 years.

$$8200\left(\underset{\text{or}}{1-2\%}\right)^9 = \$6836.73$$
$$8200(.98)^9$$

11. The initial value of a book is $58 and <u>decreases</u> at a rate of 7% per year. Use an exponential function to find the value of the book after 8 years.

$$58\left(1-7\%\right)^8 = \$32.46$$
$$58(\quad)^8$$

12. The population of a town is <u>decreasing</u> at a rate of 2.5% per year. If the population in 2000 was 28,000, what is the expected population in 2015 if this rate of decrease continues?

2015
−2000

$$28000\left(\underset{\text{or}}{1-2.5\%}\right)^{15} = 19152$$
$$28000(.975)^{} =$$