

Increasing, interest, appreciate  
G rise/rose

Decreasing, depreciate,  
D. reduce

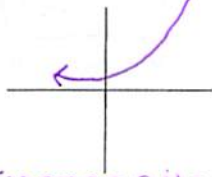
# Growth and Decay Notes

Name \_\_\_\_\_ Class Period \_\_\_\_\_

Determining if an exponential graph is growth or decay:

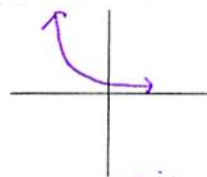
$$y = ab^x$$

Growth if  $b > 1$



Increasing

Decay if  $0 < b < 1$



Decreasing

Determine if the following functions are growth or decay? Increasing or decreasing?

a)  $y = 3^x + 4$   
Growth  
Inc.

b)  $y = \left(\frac{2}{5}\right)^{x-5}$   
Decay  
Dec.

d)  $y = 4^{-x} + 8$   
Decay  
Dec.

f)  $y = \frac{1}{4} \left(\frac{9}{2}\right)^x$   
Growth  
Inc.

Exponential **Growth** Model:  $y = P(1+r)^t$

Exponential **Decay** Model:  $y = P(1-r)^t$

- $y$  = balance/ending amount
- $P$  = initial amount / Principal
- $t$  = time (years)
- $r$  = % of increase / growth rate (in decimal form)
- $1+r$  = growth factor

- $y$  = balance/ending amount
- $P$  = initial amount / Principal
- $t$  = time (years)
- $r$  = % of decrease / decay rate
- $1-r$  = decay factor

1. In 2000, the cost of tuition at a state university was \$4300. During the next 8 years, the tuition rose 4% each year.

a. Write a model that gives the tuition  $y$  (in dollars)  $t$  years after 2000.  
 $y = 4300(1+0.04)^t$   $y = 4300(1.04)^t$   $4\% = .04$

b. What is the growth factor?  
1.04

c. How much would it cost to attend college in 2010? In 2015?

$y = 4300(1.04)^{10}$   
 $y = \$6365.05$

$t=10$   $t=15$   $y = 4300(1.04)^{15}$   
 $y = \$7744.06$

d. How long will it take for tuition to reach \$9000?

$9000 = 4300(1.04)^t$   $t = ?$   $t = 19 \text{ years}$

2. A 2010 Honda Accord depreciates at a rate of 11% per year. The car was bought for \$25,000.

a. Write a model that gives the value of the car  $y$  (in dollars)  $t$  years after 2000.  
 $y = 25000(1-.11)^t$   $y = 25000(.89)^t$   $11\% = .11$

b. What is the decay factor?  
.89

c. How much is the car worth now? In 2015?

$$y = 25000(.89)^3$$
$$y = \$17,624.23$$

$t=3$     $t=5$

$$y = 25000(.89)^5$$
$$y = \$13,960.15$$

d. How long will it take for my car to be worth half?

$$\frac{25000}{2} = 12,500 \quad 12,500 = 25000(.89)^t \quad t = 6 \text{ years}$$

3. Suppose you start work at \$600 a week. After a year, you are given two choices for getting a raise:

Opt. 1: 2% a year

Opt. 2: a flat \$15 a week raise for each successive year.

Which option is better?

4. Which option has the greatest ROC from [3, 6]?

Option 1

An investment of \$1,000 earns interest at a rate of 3.75%, compounded monthly.

Option 2

