$y = ab^x$ → • double • tripled • half

a = Starting value

b = growth or decay factor

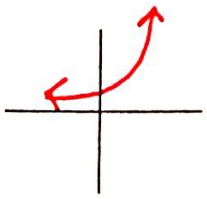
Today = % → different equation

Growth and Decay Notes

Name _____ Class Period _____

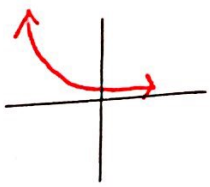
Determining if an exponential graph is growth or decay:

Growth if b>1



• grows
• increasing
• Rises
• ~~gaining~~ interest gaining

Decay if 0<b<1



• decay
• decreases
• depreciate

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

a) $y = 3^x + 4$ b=3 Growth

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

d) $y = (\frac{1}{4})^x + 8$ b=$\frac{1}{4}$ Decay

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

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

- y = Ending Amount
- P = Starting value
- t = time
- r = Rate (% → change decimal)
- 1 + r = Growth Factor

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

- y = Ending Amount
- P = Starting value
- t = time
- r = 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. R: 4% → .04

   a. Write a model the gives the tuition y (in dollars) t years after 2000.

   $y = P(1+r)^t$ $y = 4300(1+.04)^t$ or $y = 4300(1.04)^t$

   b. What is the growth factor?

   1.04

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

   $y = 4300(1.04)^{10} = \$ 6365$

   $y = 4300(1.04)^{15} = \$ 7744$

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

   $9000 < 4300(1.04)^t$

   ① Guess & Check
   ② Make a table of values.

   19 years

To change # from % to decimal: ① Divide by 100 ② Move decimal place twice to Left!

(A) 5%. 5% = 5.0% → 0.05

(B) 7.5% → .075

(C) .15% → .15

R: 11% → .11 P

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

   a. Write a model the gives the value of the car y (in dollars) t years after 2001.

$y = P(1-r)^t$ $y = 25000(1-.11)^t$ or $y = 25000(.89)^t$

   b. What is the decay factor?

.89

   c. How much is the car worth now? In 2015? (2017)

$y = 25000(.89)^7 = \$11,057.83$

$y = 25000(.89)^5 = \$13,960.14$

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

$25,000/2 = \$12,500$ Table of values $12,500 = 25000(.89)^x$ x or $t =$ 6 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?