6-3: Real World Applications

Exponential Growth/Decay

Objectives: I can determine the difference between exponential growth and decay from an equation or graph

I can calculate exponential growth and decay

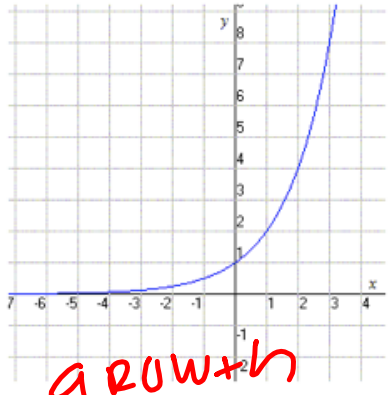
Vocab:

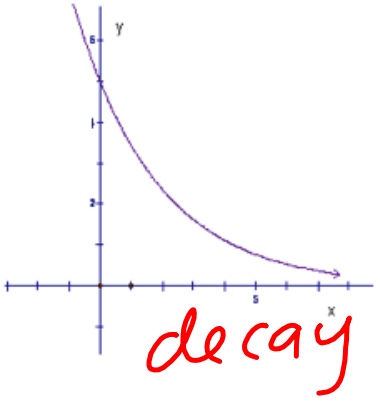
growth- $b > 1$

decay- $b < 1$

$$y = a \cdot b^x$$

Exponential Growth vs. Decay





Determining whether growth or decay from an equation:

$$y = a \bullet b^x$$

initial value (y-int)

growth rate

State whether the following equations are growth or decay

b>1 b<1

$y = 2 \cdot 3^x$ Growth

$y = 3 \cdot \left(\frac{1}{2}\right)^x$ decay

$y = \frac{3}{4} \cdot 5^x$ growth

1.75

$y = \frac{5}{3} \cdot \left(\frac{7}{4}\right)^x$ growth

$y = 7 \cdot 0.8^x$ Decay

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Practice converting between decimals and percents:

% → . ÷100 . → % ×100

20% : 0.2 (20/100)

150% : 1.5 (150/100)

4% : .04 (.04/100)

9.3% : .093

1% : .01

0.2% : .002

0.06% : .0006

0.39 : 39%

1.23 : 123%

0.56 : 56%

0.034 : 3.4%

0.05 : 5%

0.003 : 0.3%

0.0008 : .08%

The equation that models exponential growth/decay is:

$$y = a(1 \pm r)^t$$

a: initial value

r: rate AS A DECIMAL

y = final amount

t = time

$\pm$ $+$: growth

$-$: decay

Identify the following situations as growth or decay:

a) In 2008 the town of flat creek had a population of about 280,000 and a growth rate of 0.85% per year.

growth

b) During an economic recession, a charitable organization found that its donations dropped by 1.1% per year. Before the recession, its donations were $390,000.

decay

c) In 2000, 2200 students attended Polaris High School. The enrollment has been declining 2% annually?

decay

Example 1: A college's tuition has risen 5% each year since 2000. The tuition in 2000 was $10,850.

$y = a(1 \pm r)^t$

a) Write an equation to represent the amount of the tuition t years after 2000.

$y = 10{,}850(1 + .05)^t$

b) How much will tuition cost for those attending college in 2015? What about 2018?

2015

$y = 10850(1 + .05)^{15}$

$y = \$22{,}556.37$

2018

$y = 10850(1.05)^{18}$

$y = 26{,}111.82$

Example 2: The prize for a radio station contest begins with a $100 gift car. Once a day, a name is announced. The person has 15 minutes to call or the prize increases by 2.5% for the next day.

a) Write an equation to represent the amount of the first card in dollars after t days with no winners.

$$y = 100(1 + .025)^t$$

b) How much will the gift card be worth if no one wins after 10 days?

$$y = 100(1.025)^{10}$$

$$y = \$128$$

Example 3: A fully inflated child's raft for a pool is losing 6.6% of its air every day. The raft originally contained 4500 cubic inches of air.

a) Write an equation to represent the loss of air.

$y = a(1 \pm r)^t$

$y = 4500(1 - .066)^t$

b) Estimate the amount of air in the raft after 7 days.

2790.23 in^3

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