Linear Approximation (Extra/Interpolation)

Problems.

1. Consider $f(x) = \sqrt[3]{x+1}$. We know that $\sqrt[3]{8} = 2$ and $\sqrt[3]{27} = 3$. Estimate what $\sqrt[3]{15}$ is.

2. A city has population $250,000$ in the year 2000 and $320,000$ in the year 2010. Use these two points to estimate the population in 2005.

Proportionality

x is proportional to y means...

x is inversely proportional to y means...

Exponents and Logarithms

How does log work?

Problems.

Use the definition of logarithm to find the following.

1. $\log(1000000000) =$
2. $\log(\frac{1}{100000}) =$
3. $\log_5(25) =$
4. $\log_2(\frac{1}{4}) =$
5. $\log_3(3) =$

What are the five exponent-and-logarithm rules that you have learned?

	Exponent Rules	Logarithm Rules	
(1)	$10^a \times 10^b =$	$\log(xy) =$	
(2)	$10^0 =$	$\log(1) =$	
(3)	$10^{-a} =$	$\log(\frac{1}{x}) =$	
(4)	$(10^a)^p =$	$\log(x^p) =$	
(5)	$\frac{10^a}{10^b} =$	$\log(\frac{x}{y}) =$	

Application of Logarithms

Solving equations

1.

$$3^x = 71$$

2.

$$2^{x+1} = 5^{2x}$$

3.

$$5 \cdot 7^x = 6^{-1+x}$$

Half-life

Suppose we have A_0 grams of a substance initially and we know that its half-life is K years. We can find a formula $A(t)$ which tells us that amount of this substance after t years. What is it?

*The half-life K can have units other than years. This formula still works as long as we make t to have the same units as K.

Problems.

1. The half-life of element X is 50 years. If there are $80g$ initially

a) How much is there after 50 years?
b) How much is there after 100 years?
c) How much is there after 150 years?
d) How much is there after 1000000 years?
e) How much is there after x half lives have passed?
f) How mcuh is there after t years?
g) How much is there after 17 years?
h) When will $50g$ remain?

2. There are $150g$ of element Y at noon. At 4 pm there are only $100g$ left. What is the half life of element Y?

Double-life

Suppose we have A_0 grams of a substance initially and we know that its double-life is K years. We can find a formula $A(t)$ which tells us that amount of this substance after t years. What is it?

Compound Interest

Suppose we have M_0 dollars in the bank initially and we know the interest rate is $r\%$ compounded yearly. We can find a formula $M(t)$ which tells us the amount of money after t years.

Problems.

1. A bank pays 3% interest compounded annually. If you put \$5000 in your account now (Feb 2012), how much money will you have
a) in Feb 2013?
b) in Feb 2014?
c) in Feb 2015?
d) t years from now?

2. Same as above. Your goal is to have half a million in your bank account. How long is it going to take?