Lesson 3.4 and 3.5

Compound Interest and Effective Rate (ER)

**Example 1:**

One dollar is deposited at an interest rate of 100% yearly.

Find the balance and the ER after 1 year if interest is compounded:

1. Yearly
2. Monthly
3. Daily
4. Hourly
5. Every Minute
6. Every Second

**Solution**

a) 

b) 

c) 

d) 

e) 

f) 

For any initial amount “a” and interest rate r, the balance is:



(r or k) = continuous %, rate of growth / decay

a = initial amount

e = natural base = 2.718282...

t = time elapsed

Effective Rate (ER)

1. Yearly: 



1. Monthly: 
2. Daily: 

**Example 2:**

A population is increasing exponentially at a continuous rate of 4% annually. The initial population is 45 million.

1. Write a model to represent population *P* in millions as a function of time *t* in years.
2. What is the population when *t* is equal to 6 years?
3. When will the population be 62 million?

**Solution:**

a)



b)



c)



Carbon 14 decaying at a continuous rate of 3%, the initial amount is 58:



**Logarithms**



Babylonian or Heron’s method (Greek mathematician -1st century)

1. Let N = number whose square root we want to find.
2. Let x= first approximation of the root.
3. Then, second approximation of N/x
4. New approximation is the average of the last two 
5. If the approximation obtained in step (3) is equal to approximation obtained in step (4) then you’ve found the answer, if not then reiterate and try again.

**Example 1:**

Find the square root of 37 by using Heron’s method.

**Solution:**

Let N = 37

Let first approximation by x = 6

Then, a new approximation is 0.5(6+37/6)=6.0833

Let x = 6.0833

Then a new approximation is 0.5(6.0833+37/6.0833)=6.082762557

Let x = 6.082762557.

Then, a new approximation is 0.5(6.082762557+37/6.082762557)=6.08276253

Let x = 6.08276253

Then, a new approximation is 0.5(6.08276253+37/6.08276253)=6.08276253.

Last approximations are equal. Thus the square root of 37 is 6.08276253.



**Lesson 4.1 Logarithms**

If  then 

“y is the logarithm of x in base 10.”

“y is the exponent to which we have to raise 10 to get x.”

We know: log(2) = 0.301030, log(3) = 0.477121

**Example 1:**

Find the logarithm of 6.

“Look for the exponent x in which 10^x = 6”

**Solution:**



Property:

If 

Then 

**Example 2:**

Find the logarithm of 1.5.

**Solution:**



Property:

If 

Then .

**Example 3:**

Find 

**Solution:**



**Property, or Power Rule:**

If ****

Then



**Example 4:**

Solve 