

# Math 1050 ~ College Algebra

## 20 Applications of Exponentials and Logarithms

### Simple, Compound and Continuously Compounded Interest

#### EX 1

If you invest \$100 at a yearly interest rate of 5%, show how it will grow during the first five years.

Simple Interest

Compound Interest

#### EX 2

How much must you invest at age 40 so that you will have a million dollars by the time you retire at 70? Assume an interest rate of 7% compounded annually.

In general, the formula for compound interest is  $A = P \left(1 + \frac{r}{n}\right)^{nt}$

$A$  = balance after  $t$  years

$P$  = principal

$r$  = annual interest rate

$t$  = number of years

$n$  = number of times it is compounded per year

### **EX 3**

Show the difference between compounding one time per year and twelve times per year when investing \$1000 at 5% interest for 10 years.

### **EX 4**

What if the compounding on example 3 is continuous?

## **Exponential Growth and Decay**

$A(t) = A_0 e^{kt}$  is the general formula for the exponential growth or decay of a substance.

### **EX 5**

The Half-life of radium ( $^{226}\text{R}$ ) is 1620 years. What percent of the radium will still be present after 150 years?

## EX 6

A certain strain of dangerous bacteria is known to grow from 1000 to 5000 in 5 hours. Assume it grows according to the formula above.

**6a)**

Determine  $k$ , the growth constant and find a formula for the growth,  $A(t)$ .

**6b)**

When will the number present be 12,000?

## EX 7

A car that is priced at \$25,000 new, is worth \$15,000 after two years.

**7a)**

Find the linear model of depreciation.  $V = mt + b$

**7b)**

Find the exponential model of depreciation.  $V = ae^{kt}$

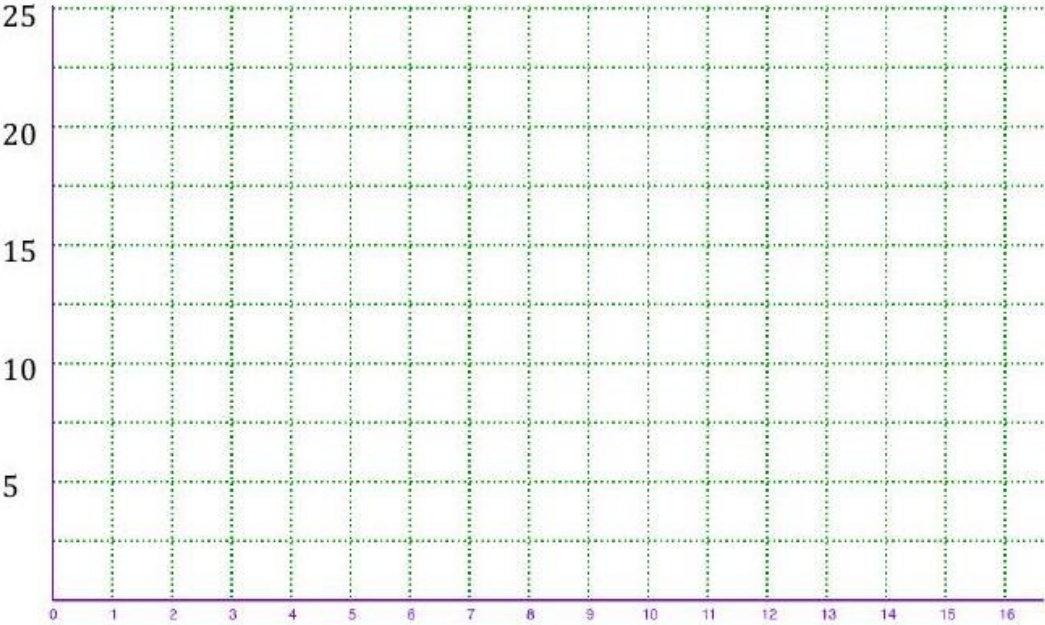
**7c)**

Sketch a graph of the two models.

**7d)**

Determine the value of the car at the end of five years for each of the models.

Value in \$1000



time in years