MATH 125 College Algebra   Name______________________________

Formulas and Examples
Continuous Exponential Growth and Decay Model:

$$\boxed{A = A_0\, e^{kt}}$$

A_0 is the initial amount of substance, A is the amount of substance after time t has passed.
k a constant that depends on the rate of growth (positive) or decay (negative).

Compound Interest Formula:

$$\boxed{A = A_0 \left(1+\frac{r}{n}\right)^{nt}}$$

A_0 is the initial amount inversted, A is the account value after time t has passed.
r is the annual interest rate. n is the number of compounding periods per year.

$$\left(1+\frac{r}{n}\right)^{nt} \quad let\ n = xr \rightarrow \left(1+\frac{r}{n}\right)^{nt} = \left(1+\frac{r}{xr}\right)^{xrt} = \left[\left(1+\frac{1}{x}\right)^{x}\right]^{rt} \quad As\ x\rightarrow\infty,\ \left(1+\frac{1}{x}\right)^{x}\rightarrow e \quad \text{Euler's Number} \approx 2.71828\ldots$$

$$\therefore\ As\ x\rightarrow\infty,\quad \boxed{A = A_0\, e^{rt}} \quad \text{Continuous Growth or Decay}$$

If R is the intensity of an earthquake (Richter Scale). A is the amplitude (measured in micrometers), and P is the period (the time of one oscillation of Earth's surface, measured in seconds), then

$$\boxed{R = \log \frac{A}{P}}$$

The more acidic a solution, the greater the concentration of hydrogen ions (moles per liter). This concentration is indicated indirectly by the pH scale, or hydrogen ion index.

If $\left[\,H^{+}\right]$ is the hydrogen ion concentratrion in gram-ions per liter, then $\boxed{\mathrm{pH} = -\log\left[\,H^{+}\right]}$

Loudness of sound is measured in decibels and is caluculated by a formula using the sound intensity measured in watts per square meter. The threshold intensity of sound, I_0, is 10^{-12} watts / m^2.

$$\boxed{L = 10\left(\log I - \log I_0\right)} \qquad \boxed{L = 10\left(\log I + 12\right)}$$

$\langle EX\ 1\rangle$ \$25,000 is deposited into an accout earning 3.5% interest compounded quarterly for 18 years.
What will the value of the account be at the end of that time?

$\langle EX\ 2\rangle$ \$25,000 is deposited into an accout earning 3.5% interest compounded continuously for 18 years.
What will the value of the account be at the end of that time?

$\langle EX\ 3\rangle$ The population of a city is 40,000 people, but changing economic conditions are causing the population to decrease by 2% each year. If this trend continues, then what will the population be in 10 years?

$\langle EX\ 4\rangle$ In the example #3 situation how long would it take for the population to drop to 20,000 people?

$\langle EX\ 5\rangle$ Over a time period of 20 days a 100 gram sample of Radon - 22 was found to decay to 2.6783 grams. What is the half-life of Radon - 22? How long will it take the original sample to decay to 1 gram.

$\langle EX\ 6\rangle$ Find the measure on the Richter Scale of an earthquake with an amplitude of 10,000 micrometers (1 centimeter) and a period of 0.1 second.

$\langle EX\ 7\rangle$ What would the period need to be for the an earthquake of 10,000 micrometers need to be for a Richter Scale reading to be measured at 7.5?

$\langle EX\ 8\rangle$ Find the hydrogen-ion concentration of seawater if its pH is 8.5. Write your answer in scientific form.

Logistics Growth Model:

"C" is the Ceiling Population or Maximum Attainable Value

$$f(t) = \frac{C}{1 + ae^{-bt}} \quad \text{or} \quad A = \frac{C}{1 + ae^{-bt}}$$

$a,\ b,\ and\ C$ are constants, with $b > 0\ and\ C > 0.$

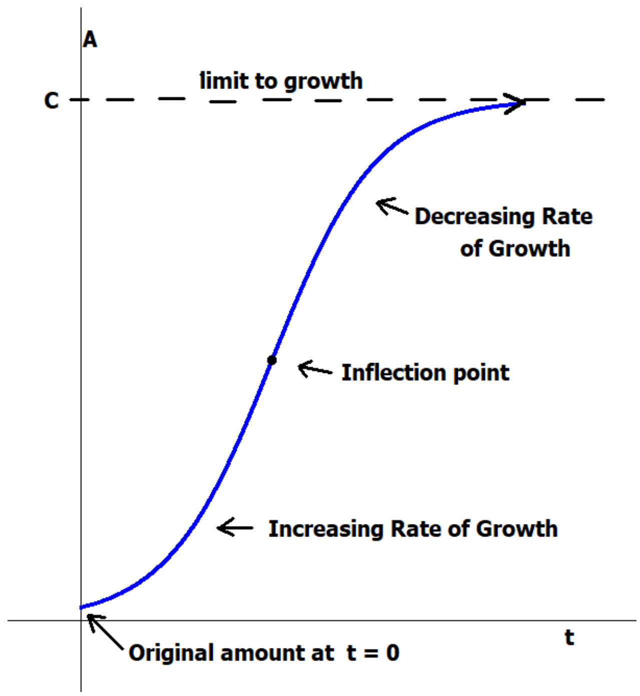
Note: $As\ t \to \infty,\ e^{-bt} \to 0,$

$thus\ f(t) \to C\quad or\quad A \to C$

Note: When $t = 0$ you get $f(0) = \dfrac{C}{1 + a}$

which is the initial population or value of the function.

Note: *The function has a Horizontal Asymptote* $y = C$.



$\langle EX\ 9\rangle$ The logistics growth function $f(t) = \dfrac{900}{1+59e^{-0.4t}}$

describes a wolf population t years after it is placed into a new area.

a. How many wolves were initially introduced into the area?

b. How many wolves were there in the area after 10 years after being placed in the area?

c. What is the limiting size of the wolf population in the area?

d. How much time will pass before the wolf population reaches 750 wolves?