Chapter 10 Formulas

Properties of Exponents 10-1

$a^m a^n = a^{m+n}$	$\frac{a^m}{a^n} = a^{m-n}$
$(ab)^m = a^m b^m$	$(a^m)^n = a^{mn}$
$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$a^0 = 1$
$a^{-m} = \frac{1}{a^m}$	

If n and m are integers greater than 0, and b is a positive real number then:

$$b^{\frac{m}{n}} = \left(\sqrt[n]{b}\right)^m = \sqrt[n]{b^m}$$

Definition of Logarithm:

If b and N are positive numbers $(b \neq 1)$

$$\log_b N = K \text{ if and only if } b^k = N$$

Properties of Logarithms:

$\log_b M = \log_b N$ if and only if $M = N$

$\log_b b^k = k$

$b^{\log_b N} = N$

$\log_b b = 1$

$\log_b 1 = 0$

Laws of logarithms 10-5

For any positive numbers x and y, where a is any positive integer where $a \neq 1$

$$\log_a (x \bullet y) = \log_a x + \log_a y$$

For any positive number z, any number p, and any logarithm base a,

$$\log_a x^p = p \bullet \log_a x$$

For any positive numbers x, y, and any logarithm base a,

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

10-6 Change of Base Theorem

$$\log_a x = \frac{\log_b x}{\log_b a}$$

10-7 Exponential Growth and Decay

Formula for exponential Growth:

$$N = ne^{kt}$$

Formula for Decay:

$$n = Ne^{kt}$$

Compound Interest Formula:
If an initial amount P (called the principal) is invested
at an annual interest rate r compounded n times a year,
Then in t years the interest will grow to a final amount A.

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

Doubling-Time Growth Formula:

If a population of size ***n*** doubles every ***d*** years (or hours, or days, or any other unit of time), then the number ***N*** in the population at time ***t*** is given using the following formula:

$$N = n_0 \bullet 2^{\frac{t}{d}}$$

Half-Live Decay Formula

If an amount ***N*** has a half-life ***h***, then the amount remaining at time ***t*** is represented by the formula:

$$n = N\left(\frac{1}{2}\right)^{\frac{t}{h}}$$

N_0