5-7
Exponential Equations
Changing Bases

Example:

$9^{2t} = 3\sqrt[3]{3}$

$(3^2)^{2t} = 3^1 \cdot 3^{1/3}$

$3^{4t} = 3^{4/3}$

$4t = 4/3$

$t = \frac{1}{3}$

$7^x = 193$

take log of both sides

$\log_7 193 = x$

$\log 7^x = \log 193$

$x \frac{\log 7}{\log 7} = \frac{\log 193}{\log 7}$

$x = 2.704$

could do ln.

$\ln 7^x = \ln 193$

$\frac{x \ln 7}{\ln 7} = \frac{\ln 193}{\ln 7}$

$x =$

Change of base formula

$$\log_b c = \frac{\log_a c}{\log_a b}$$

You may change to any base that you want. What base(s) would be the easiest to change to?

base 10 - log
or base e - ln
} on calc.

Example:
$\log_{12} 189$ $= \frac{\log 189}{\log 12} \approx 2.11$

or $= \frac{\ln 189}{\ln 12}$

Suppose that the population of a bacteria colony doubles every 7 hours. Today the population is 90. When will the population be 1000?

$A(t) = A_0(b)^{t/k}$

$\frac{1000}{90} = \frac{90(2)^{t/7}}{90}$

$11.1111 = 2^{t/7}$

$\log_2 11.111 = \frac{t}{7}$

Change of base

$\frac{\log 11.1111}{\log 2} = \frac{t}{7}$

$3.47 = \frac{t}{7}$

$24.3 = t$

hours