To hear and view this Pencast PDF on your computer,
click here to get the latest version of Adobe® Reader®

$\boxed{\text{Log Properties}}$

1) $\log_b(xy) = \log_b x + \log_b y$

2) $\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$

* 3) $\log_b(x^r) = r\log_b x$

4) $\log_b b = 1$; $\log_b 1 = 0$

5) $\log_b x = \dfrac{\log_c x}{\log_c b}$

6) $b^{\log_b x} = x$

$\boxed{\text{Example}}$

10) $5.3(10^x) = 2$

$$\frac{5.3(10^x)}{5.3} = \frac{2}{5.3}$$

$$10^x = 0.3774$$

$$\log_{10} x = \log 0.3774$$

$$x \cdot \overset{1}{\cancel{\log_{10} 10}} = \log(0.3774)$$

$$x = \log(0.3774)$$

$$x = -0.423198$$

To hear and view this Pencast PDF on your computer,
click here to get the latest version of Adobe® Reader®

$3^{x+2} = 27^{x-1} \cdot 9$ "like bases"

$3^{x+2} = 3^{3(x-1)} \cdot 3^{2}$

$3^{x+2} = 3^{3x-3} \cdot 3^{2}$

$3^{x+2} = 3^{3x-1}$

$x + 2 = 3x - 1$

$-x \qquad -x$

$2 = 2x - 1$

$+1 \qquad +1$

$3 = 2x$

$\frac{3}{2} = x$

"unlike bases"

$2^{3x-1} = 5^{x+4}$

$\ln 2^{3x-1} = \ln 5^{x+4}$

$(3x-1) \cdot \ln 2 = (x+4) \cdot \ln 5$

$(3 \cdot \ln 2)x - \ln 2 = x \ln 5 + 4\ln 5$

$(3 \cdot \ln 2)x - x\ln 5 = 4\ln 5 + \ln 2$

$x(3\ln 2 - \ln 5) = 4\ln 5 + \ln 2$

$\boxed{x = \frac{4\ln 5 + \ln 2}{3\ln 2 - \ln 5}}$

To hear and view this Pencast PDF on your computer,
click here to get the latest version of Adobe® Reader®

$(3x-1) \cdot \underbrace{\ln 2}_{0.6931} = (x+4) \underbrace{\ln 5}_{1.609}$

"Equations w/ Logs"

$\log_3 (x-1) + \log_3 2 = 1$

$\log_3 2(x-1) = 1$

$2x - 2 = 3^1$

$ +2 \quad +2$

$\boxed{x = \frac{5}{2}}$

To hear and view this Pencast PDF on your computer,
click here to get the latest version of Adobe® Reader®

$\boxed{\text{Exercises}}$

~~34~~ 35 Compound Interest Formula

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

a = accumulated amt
r = rate
t = time
n = # compounded
p = principal/initial amt

Compounded Continuously

$$A = Pe^{rt}$$

P = 1000, triples - 3000

continuously... $A = Pe^{rt}$

$$\frac{3000}{1000} = \frac{1000e^{0.10t}}{1000}$$

$$3 = e^{0.10t}$$

$$\ln 3 = \ln e^{0.10t}$$

$$\ln 3 = 0.10t \cdot \cancel{\ln e}^{1}$$

$\log_e e$

$$\frac{\ln 3}{0.10} = t$$

$$10.9861 = t$$

roughly 11 years

To hear and view this Pencast PDF on your computer,
click here to get the latest version of Adobe® Reader®

$\boxed{\text{Exercises}}$

54 half life = time for half of a substance to decay

$Q = Q_0 e^{kt}$ $k > 0$ "growth"

$k < 0$ "decay"

Strontium 90 $\frac{1}{2}$ life = 28 years

$Q_0 = A$ = starting amt

$Q_0 = 1000$

in 28 years, ½ of it is left

$Q = 500$ $(28, 500)$

$Q = Q_0 e^{kt}$ "Equation set-up"

$500 = 1000 e^{k(28)}$

$\frac{1}{2} = e^{28k}$

$\ln(0.5) = \ln e^{28k}$

$\frac{\ln(0.5)}{28} = k = -0.02476$

$Q = Q_0 e^{-0.02476}$

b) $Q_0 = 5000$

$Q = 2000$ so, $2000 = 5000 e^{-0.02476t}$

$0.4 = e^{-0.02476t}$

$\ln(0.4) = \ln e$

$\ln(0.4) = -.02476t \cdot \ln e^1$

$\frac{\ln(0.4)}{-0.02476} = t$

$37 \text{ yrs} = t$