MATH 220-02
MCKENZIE

QUIZ 2

KEY

1. Solve the exponential equation for x, first using base 3 logarithm, then common logarithm. Your answers will look different.

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

$\log_3 4^x = \log_3 3^{2x-1}$

$x \log_3 4 = (2x-1)\log_3 3$

$x \log_3 4 = 2x - 1$

$x \log_3 4 - 2x = -1$

$x(\log_3 4 - 2) = -1$

$x = \dfrac{-1}{\log_3 4 - 2}$

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

$\log 4^x = \log 3^{2x-1}$

$x \log 4 = (2x-1)\log 3$

$x \log 4 = 2x \log 3 - \log 3$

$x \log 4 - 2x \log 3 = -\log 3$

$x(\log 4 - 2\log 3) = -\log 3$

$x = \dfrac{-\log 3}{\log 4 - 2\log 3}$

2. Solve the logarithmic equation for x

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

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

$(x-1)(x+2) = 10^1$

$x^2 + x - 2 - 10 = 0$

$x^2 + x - 12 = 0$

$(x-3)(x+4) = 0$

$x = 3, \ -4$

Discard since $\log(-4-1) + \log(-4+2)$ DNE i.e. log(negative)

3. A sum of money P is invested into an account that pays 1% annually. How long (t) will it take to double the investment if it is compounded: (Leave answer in log form)

Quarterly

$n=4$

$r=.01$

$F=2P=P\left(1+\frac{r}{n}\right)^{nt}$

$2\cancel{P}=\cancel{P}\left(1+\frac{.01}{4}\right)^{4t}$

$2=(1+.0025)^{4t}$

$\log_2 2=4t\log_2(1.0025)$

$1=4t\log_2(1.0025)$

$$t=\frac{1}{4\log_2(1.0025)}$$

or in base 10

$$t=\frac{\log 2}{4\log 1.0025}$$

Continuously

$2P=Pe^{rt}$

$2=e^{rt}$

$2=e^{.01t}$

$\ln 2=\ln e^{.01t}$

$\ln 2=.01t\ln e$ ($\ln e=1$)

$$t=\frac{\ln 2}{.01}$$