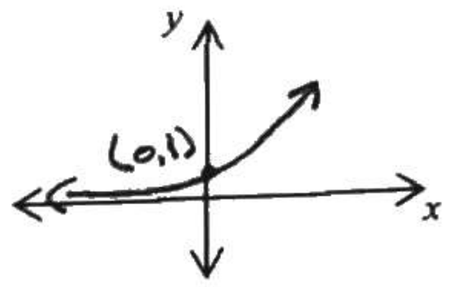
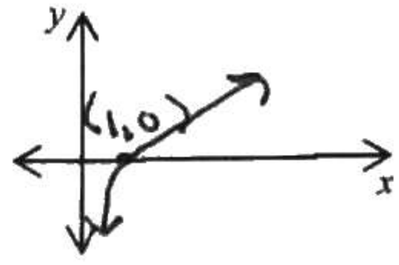
Date _____ 5.6 Notes Log & Exp. Eqns

Observation:

If you are solving an *exponential equation*, your domain is $(-\infty, \infty)$. That means your answer(s) can be any real number.



...but...



If you are solving a *logarithmic equation*, your domain is $(0, \infty)$. That means your answer must be a positive number.

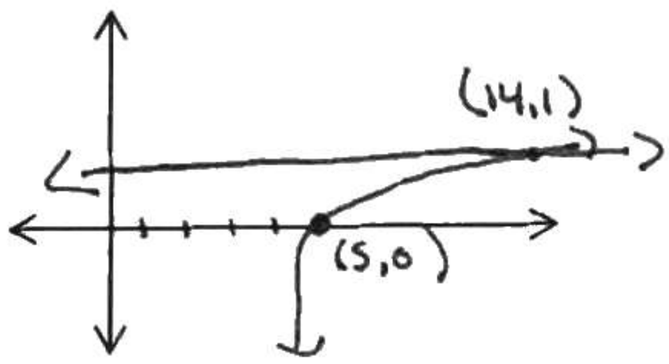
Always check for extraneous solutions after you solve a log equation.

Solve the log equations *graphically*. Be able to sketch the graphs before you use your TI.

a) $\log(x-4)=1$

$y_1 = \log(x-4)$

$y_2 = 1$

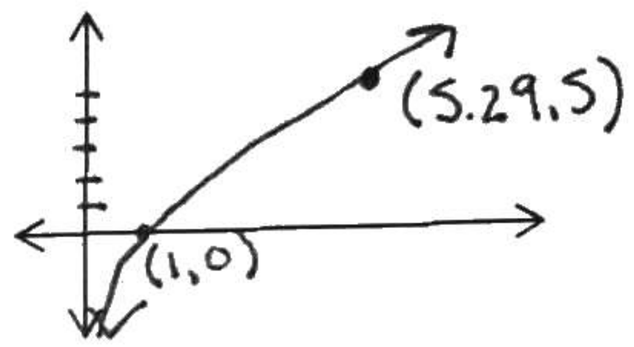


Answer $x = 14$

b) $3\ln x = 5$

$y_1 = 3\ln x$

$y_2 = 5$



Answer $x \approx 5.29$

Solve the log equations *algebraically*.

c) $3\log x = \log 40 - \log 5$

$\log x^3 = \log \frac{40}{5}$

$\sqrt[3]{x^3} = \sqrt[3]{8}$

$x = 2$

d) $\ln x + \ln(x+1) = \ln 2$

$\ln[x(x+1)] = \ln 2$

$x^2 + x = 2$

$x^2 + x - 2 = 0$

$(x+2)(x-1) = 0$

$x = 1$

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

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

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

$3x = x^2 - 4$

$0 = x^2 - 3x - 4$

$n = (x-4)(x+1)$

$x = 4$

f) $\log_2 x + \log_2(x-2) = 3$

$\log_2[x(x-2)] = 3$

$2^3 = x^2 - 2x$

$0 = x^2 - 2x - 8$

$0 = (x-4)(x+2)$

$x = 4$

Applications: Solve algebraically.

Review: **Compound Interest Formulas:** $A = P\left(1+\frac{r}{n}\right)$ or $A = Pe^{rt}$

g) How long will it take an investment of $5000 to double if the interest rate is 6% compounded *quarterly*?

$10000 = 5000\left(1+\frac{.06}{4}\right)^{4t}$

$\log 2 = \log(1.015)^{4t}$

$\log 2 = 4t \log(1.015)$

$t = \frac{\log 2}{4\log(1.015)} \approx 11.64$ years

h) At what rate of interest compounded *continuously* should you invest your money if you want it to double in 3.7 years?

$2 = 1e^{r(3.7)}$

$\ln 2 = \ln e^{3.7r}$

$\ln 2 = 3.7r \ln e$

$r = \frac{\ln 2}{3.7} \approx .1873 \approx 18.73\%$