Problems PreCal 1508 PLTL Workshop, October 5, 2011
PL: Alex Knaust, Lecturer: Yi-Yu Liao

Please do the problems that you feel will help your group the most first (you don't have to do them in order).All handouts are available at `http://alex.knaust.info/pltlfall2011/`

1. Determine the exact values of the following (without a calculator)
   (a) $\log_2 \sqrt[4]{8}$
   (b) $\log_4 16^2$
   (c) $\log_3 -3^3$
2. Rewrite the following expressions as a single logarithm if possible
   (a) $\ln 2 + \ln x$
   (b) $-4 \log_6 2x$
   (c) $3 \ln x - 2 \log_2 y$
   (d) $\ln x - [\ln (x+1) + \ln (x-1)]$
   (e) $\log_3 2x + \frac{\log_5 y}{\log_5 3}$
3. Solve for x in the following equations
   (a) $e^{3x} = 21$
   (b) $\left(1 + \frac{0.10}{12}\right)^{12t} = 2$
   (c) $e^{2x} - 4e^{x} - 5 = 0 \qquad \textit{Hint : } e^{2x} = (e^{x})^2$
   (d) $\log 8x - \log (1 + \sqrt{x}) = 2$
   (e) $\ln x + \ln (x-2) = 1$
4. Is the identity $z^{\log_x y} = y^{\log_x z}$ true? (Why/Why not?)
5. Is the identity $(\log_x y)^2 = \log_x y^2$ true? (Why/Why not?)
6. Given the following proof of $\log_b xy = \log_b x + \log_b y$ Can you use a similar technique to show the following identities?

   Proof of $\log_b xy = \log_b x + \log_b y$.

   $$xy = b^{\log_b x} \cdot b^{\log_b y} = b^{\log_b x + \log_b y}$$

   $$\Longrightarrow \log_b xy = \log_b b^{\log_b x + \log_b y} = \log_b x + \log_b y$$

   The first equations are a result of using the inverse property of logarithms, and the second line is a consequence of taking a logarithm of the first line. □

   (a) $\log_b \frac{x}{y} = \log_b x - \log_b y$
   (b) $\log_b x^d = d \cdot \log_b x$