HOMEWORK 3 - MATH 151
DUE DATE: Monday, February 11
INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the eight problems will be chosen at random and graded. Each problem graded will offer you 5 bonus (extra) points towards your class average. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find the domain of the following logarithmic functions:

   (a) $f(x) = \log_7 (5 - 14x)$

   (b) $g(x) = \log_3 \frac{x-2}{x^2+2x-15}$

2. Graph the logarithmic function $f(x) = \log_3 x$. Use this graph and graphing techniques (shifts and reflections) to graph the logarithmic function $g(x) = -\log_3 (x + 2) + 1$. Indicate clearly the vertical asymptotes in both graphs.

3. Solve the following logarithmic equations:

   (a) $\log_x 4 = \frac{1}{2}$

   (b) $\log_5 125 = 7x + 31$

   (c) $\log_2 16^x = -8$

4. Use properties of logarithms to find the exact values of the following expressions without using a calculator:

   (a) $\log_2 (2^{-13})$

   (b) $\log_9 18 - \log_9 2$

   (c) $\log_3 8 \cdot \log_8 9$

5. If $\ln 5 = a$ and $\ln 7 = b$, write the following logarithms in terms of a and b:

   (a) $\ln \frac{5}{7}$

   (b) $\ln \sqrt[3]{\frac{7}{5}}$

   (c) $\ln 35$

6. Write as a sum and/or difference of logs:

   (a) $\log_2 (x^3 \sqrt{1 + x^2})$

   (b) $\log_5 \frac{5x^7 \cdot \sqrt[3]{1-x}}{4(x+9)^2}$

7. Write as a single log:

   (a) $\log_3 (\frac{1}{x^2}) + \log_3 (x^7)$

   (b) $3 \log_2 (x + 1) - 2 \log_2 (x + 3) - \log_2 (x - 1)$

8. Express y as a function of x (C is a real constant):

   (a) $\ln y = \ln x + \ln (x + 1) + \ln C$

   (b) $\ln (y + 4) = 5x + \ln C$