Mathematics 1090 PRACTICE EXAM III Spring 2005

1. Draw the regions defined by the following inequalities (shade the correct region on the graph) and determine (exactly not graphically) their corners.
   a) $x \geq 0, y \geq 0, x + y \leq 3, 5x + 2y \leq 10$
   b) $x + y \geq 4\,, 3x + y \geq 6\,, x + 6y \geq 6$

2. a) Draw the feasible region defined by the following inequalities : $x \geq 0\,, y \geq 0\,, 5x + 3y \leq 15\,, x + 2y \leq 6$ (shade the correct region on the graph).

   b) Determine the corners of the feasible region (exactly, not by looking at the graph).
   c) Find the maximum and the minimum of the function $f(x, y) = x + y$ and at which points they are achieved on the feasible region drawn in a).

3. Find the maximum value of $f(x, y) = 2x + y$ subject to the constraints:

$$\begin{cases} x \geq 0 \\ y \geq 0 \\ x + 2y \leq 40 \\ 3x + y \leq 60 \end{cases}$$

4. Using the properties of logarithms, find the exact value of
   a) $x = \log_4 2 + \log_4 32$
   b) $u = 4 \ln(e^2)$
   c) $x = \log_6(\frac{1}{36})$

5. Solve for x in
   a) $\log_6(x^2 + 3x + 18) = 2$
   b) $50 + 10(1.02)^{2x} = 70$

6. You invest \$15,000 on an account at a rate 6% (yearly rate), compounded monthly. How long must you wait to have \$20,000 on this account?
   Future value is given by $S = 15000(1.005)^t$, where t is the time in months.

7. The population of squirrel on a college campus in California is given by

$$y = \frac{200}{1 + 49e^{-0.25t}} \text{ where } t \text{ is in years}$$

   a) Find the number of squirrels after 1 year.
   b) When will the squirrel population reach 50?