MIDTERM 2 **Math 111** Fall 2008

NAME:

1. [5] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f and g be functions.

   T F $\sqrt{x^2+y^2} = x+y$

   T F $(f+g)(x) = f(x)+g(x)$

   T F $f(x+y) = f(x)+f(y)$

   T F $\frac{\log 2}{\log 5} = \log 2 - \log 5$

   T F Given $f(2) = 6$ and $g(x) = 3x-7$, $f(g(3)) = 12$.

Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. [2] Solve for r, writing it as a reduced fraction:

$$\frac{1}{r} + \frac{1}{t} = \frac{1}{s} + \frac{1}{u}$$

3. [2] Given $1 = \frac{1}{y} + \frac{1}{2+y}$, solve for y.

4. [6] Assume a, $b > 0$, simplify the following:

   $\dfrac{\sqrt{7a}(5b)^{\frac{3}{2}}}{(5a)^{\frac{3}{2}}(7b)^4}$

   $5\sqrt{20} - \sqrt{45} + 2\sqrt{80}$

5. [7] Write each of the following expressions as a single logarithm with only one term and then *simplify*.

   $2\ln 2x - 3(\ln x^2 + \ln x)$

   $3 - \log_6(36y)$

6. [5] Find x in the following:

   $e^x = 10^{1-x}$ $\qquad\qquad$ $7^x = 4$

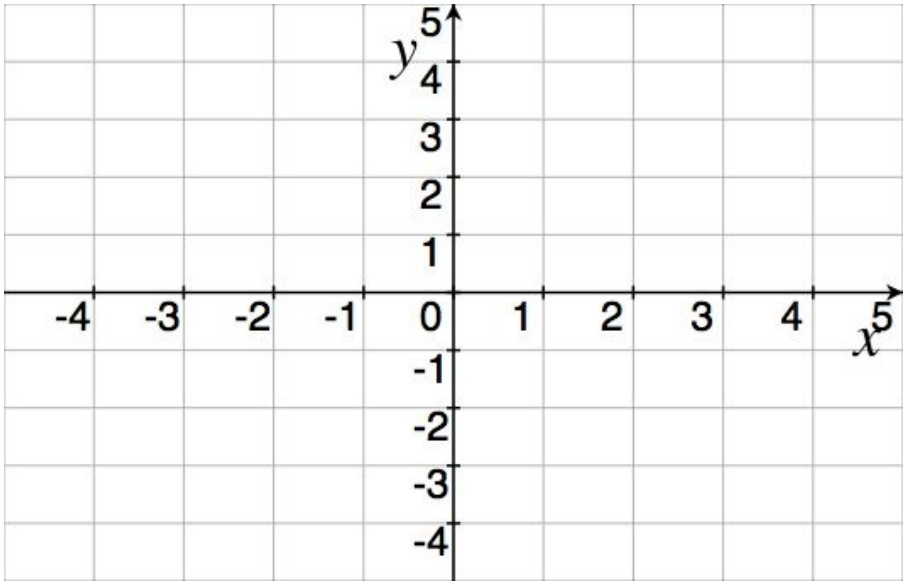
7. Let $f(x) = \frac{1}{x}$ and $g(x) = x^2 + x - 5$.

   (a) [3] Find the rule of the function $(f - g)(x)$ and its domain.

   (b) [4] Find the rule of the function $(\frac{g}{f})(x)$ and its domain.

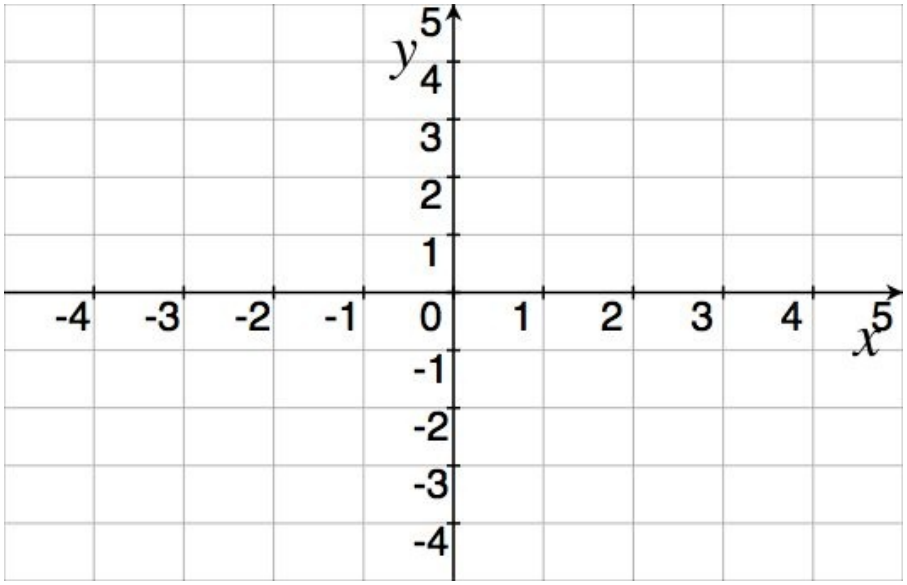
   (c) [4] Find the rule of the function $(f \circ g)(x)$ and its domain.

8. [5] List the transformations needed to transform the graph of $h(x) = |x|$ to the graph of $f(x) = |-x+2|$. Graph both h and f. Be sure to identify which one is which.



9. [4] If $f(x) = |-x+2|$ has an inverse, find it. Otherwise, restrict the domain of f so that an inverse does exist and then find that. Hint: consult the problem above.

10. [4] Graph the function m where $m(x) = \begin{cases} 4^x & x < 1 \\ \ln x & 1 \leq x < 5 \end{cases}$



11. Take an ordinary piece of typing paper and fold it in half; then the folded sheet is twice as thick as the single sheet was. Fold it in half again so that it is twice as thick as before. Keep folding in half as long as you can. Soon the folded paper will be so think and small that you will be unable to continue, but suppose you could keep folding the paper as many times as you wanted. Assume that the paper is .002 inches thick.

    (a) [2] Make a table showing the thickness of the folded paper for the first four folds (with fold 0 being the thickness of the original unfolded paper).

    (b) [2] Find an exponential function that describes the thickness of the folded paper after x folds.

    (c) [1] Explain how you would find the thickness of the paper after 20 folds?

    (d) [4] Find how many folds it would take for the thickness of the folded paper to be 6 feet.