MIDTERM 1 **Math 111** Fall 2008

NAME:

1. [2] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f be a function, and x, y, and z be positive real numbers with $z \neq 0$.

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

   T F The equation $4y^3 = x^4 + 2$, defines y as a function of x

   T F The equation $4y^3 = x^4 + 2$, defines x as a function of y

   T F The domain of $\sqrt{-x}$ consists of no real numbers.

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

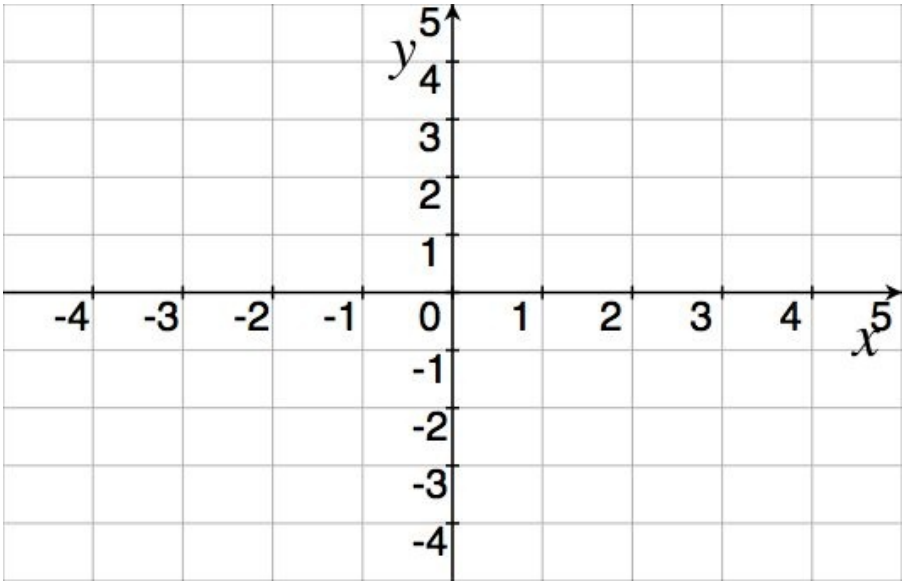
2. [2] Solve for r, writing it as a reduced fraction:

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

3. [4] Let $g(x) = |-2x-6|$. Find the number(s) z so that $g(z) = 3z - 5$.

4. [7] Graph the functions m and n

$$m(x) = \begin{cases} 3x+4 & x < -1 \\ |x| & -1 \le x < 2 \\ \sqrt{x-2} & 2 \le x \le 5 \end{cases} \qquad n(x) = \begin{cases} -2 & x < 1 \\ 2x-4 & 1 \le x \le 5 \end{cases}$$



(a) [1] $-m(-3)$

(b) [2] $m(1) + n(2)$

(c) [2] Find all x so that $m(x) = n(x)$.

(d) [3] Find all x so that $m(x) \le 1$.

5. Let $f(x) = \frac{3}{x}$ and $g(x) = f(x-2) + 7$

   - [1] Write an explicit formula for $g(x)$.

   - [1] What is $g(t+h)$.

   - [4] Compute and simplify the difference quotient for $f(x)$. Recall the difference quotient is:
   $$\frac{f(x+h) - f(x)}{h}$$

6. On the basis of data from past years, a consultant informs Bob's Bicycles that their profit from selling x bicycles is given by the function
$$p(x) = 250x - x^2/4 - 15,000.$$

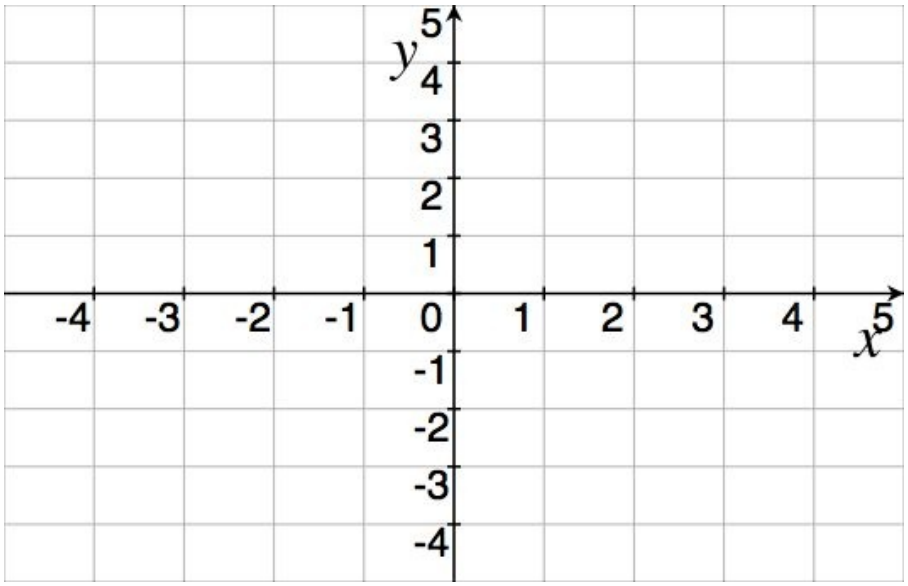
   (a) [2] Explain how you would find the profit made by selling 100 bicycles. Do *not* perform any computations.

   (b) [2] Explain how you would find the number of bicycles that, if sold, would maximize profit.

7. Let $f(x) = -x^2 + 6x - 7$.

- [3] Write f in vertex form.

- [5] List in order the graph transformations done to the graph of $y = x^2$ that will give you the graph of f. Graph f.



- [2] Determine whether the function $f(x)$ is an even function, odd function, or neither. Be sure to justify your your answer.

- [2] What is the range of $f(x)$?

8. [5] You have a 20oz latte and want it to have 11% espresso. Right now it has a 15% concentration. A friend has a latte with 5% concentration of espresso. How much of the original latte do you dump out to make room for the additive from your friend's latte, so that you have the 11% concentration you wanted? Do the calculations for this and be sure you get a *number* of oz.