MAT 121 Test 1 – Fall, 2014 Name_____
100 Points Covers Chapter 2 NO GRAPHING CALCULATORS!!!

1. Consider the relation $f = \{(-2,3),(1,5),(2,3),(3,-2)\}$.

   a. (5 pts) Is f a function?

   b. (5 pts) What is the domain of f ?

   c. (5 pts) What is the range of f ?

   d. (5 pts) Is f one-to-one? If not, explain why not.

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

   a. (5 pts) Write the function $\dfrac{f}{g}$. Do not simplify.

   b. (5 pts) What is the domain of $\dfrac{f}{g}$?

   c. (5 pts) Write the function $f \circ g$. Do not simplify.

   d. (5 pts) What is the domain of $f \circ g$?

4. (5 pts) Simplify the difference quotient for $f(x) = 2x^2 - 3x$.

Bonus (5 pts) Pass to the limit as *h* approaches zero, and show me some calculus to go with #4.

5. (5 pts) Draw a picture for the difference quotient for $f(x) = \sqrt{x}$. Describe what the difference quotient represents, in words. Do not simplify your difference quotient. That's a bonus problem, later on.

6. Let $g(x) = -\sqrt{10-5x} + 7$.

   a. (10 pts) Sketch the graph of $g(x)$, by transforming the basic function $f(x) = \sqrt{x}$. I want to see 3 points labeled in the graph of g – preferably starting with $(0,0), (1,1)$ and $(4,2)$ – and track where those points are moved to after every step, as demonstrated in class.

   b. (5 pts) State the domain and range of $g(x)$, based on your final graph.

   c. (5 pts) Find the *x*- and *y*-intercept of $g(x)$, and label them, clearly, on the graph.

7. (10 pts) Sketch the graph of $r(x) = 2(x-3)^2 - 5$ by transforming the basic function $f(x) = x^2$. I want to see 3 points labeled in the graph of f, and I want you to track where those points are moved to after every step, as demonstrated in class.

8. (5 pts) Find the *x*- and *y*-intercepts and add them to your final sketch, above. For *x*-intercept, leave final answer in simplified radical form.

9. (5 pts) Prove that $\frac{x+1}{x-3}$ is one-to-one.

10. (5 pts) Suppose *y* is jointly proportional to the square of *x* and the cube of *z*, and inversely proportional to *u* and the square root of *w*. Write an equation for this relationship between *y*, *x*, *z*, *u*, and *w*.

11. (5 pts) Explain why $x^2 + y^2 = 81$ does *not* define *y* as a function of *x*.

Answer two of the following for **Bonus** (5 pts each)

B1: Simplify the difference quotient for the function $f(x)=\sqrt{2x}$. Then pass to the limit, as *h* approaches zero.

B2: Complete the square to re-write the function $h(x)=5x^2-3x+2$ in the form $a(x-h)^2+k$. What is the vertex?

B3: What is the domain of $r(x)=\dfrac{x-5}{x^2-5x+6}$?

B4: What is the domain of $w(x)=\dfrac{x^{77}-5x^{12}+17x}{\sqrt{5-10x}}$

B5: Prove that $g(x)=-\sqrt{10-5x}+7$ is 1-to-1.

B6: Given $g(x)=-\sqrt{10-5x}+7$, find what $g^{-1}(x)$ is. $\left(\text{Hint}: (-x+7)^2=(x-7)^2\right)$

B7: Given $g(x)=-\sqrt{10-5x}+7$, find the domain and range of $g^{-1}(x)$.