MAT 121 Test 2 – Spring, 2017 Name_____
100 Points Covers Chapter 2 NO GRAPHING CALCULATORS!!!

Do your work and circle (or square-box) final answers on the separate paper, provided.

Only write on one side of each sheet. No points for what's on the back (either for or against!).

All that you should put on this cover sheet is your name.

1. (5 kindness points) I can really see how you made an effort to be clear, use one column per page, one side of writing per page, and plenty of room for my silly comments. Thanks for writing big enough to read, and really dark, which helped me see your work so easily. You helped me serve your classmates, better, too, because your paper was quick and easy to grade. I thank you on their behalf.

2. Consider the relation $R = \{(5,3),(2,4),(7,4),(4,7)\}$.

   a. (5 pts) Is R a function? If not, why not?

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

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

   d. (5 pts) What stops *R* from being 1-to-1?

3. Let $f(x) = \sqrt{x+11}$ and $g(x) = x^2 + 2x - 35$.

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

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

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

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

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

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

4. (5 pts) Write the difference quotient for $f(x) = -x^2 + 2x$, and explain how it represents the slope of the secant line, on a graph of f.

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

6. Let $g(x) = -4\sqrt[6]{2x-18} + 5$.

   a. (20 pts) Sketch the graph of $g(x)$, by transforming the basic function $f(x) = \sqrt[6]{x}$. I want to see two (2) points labeled in the graph of f, namely $(0,0)$, and $(1,1)$, and track where those points are moved to after every step, as demonstrated in video, until you've transformed f into *g*. This will take 5 graphs, counting the first graph of $f(x) = \sqrt[6]{x}$ as the first. (I number them 0 thru 4, for no good reason.)

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

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

7. (5 pts) Prove that $f(x) = \dfrac{1}{x+3}$ is one-to-one.

8. (5 pts) The force of twerp, *T*, varies jointly with *x* and *w*, and inversely with the cube root of *z*. Write an equation relating *T* to *x*, *w*, and *z*.

Bonus Section (5 pts each) Are you smarter than the average bear?

B1. Write down your answer to #5, again, and pass to the limit as *h* approaches zero, and show me some calculus.

B2. Simplify the difference quotient for the function $f(x) = \sqrt{3x}$. Then pass to the limit, as *h* approaches zero, and demonstrate an early aptitude for Calculus.

B3. Add the line to your picture in **#5**, that represents the tangent to f at the point $(x, f(x))$.

B4. Complete the square to re-write the function $h(x) = 4x^2 - 7x + 11$ in the form $a(x-h)^2 + k$. What is the vertex?

B5. Sketch the graph of the piecewise-defined function $h(x) = \begin{cases} \sqrt{x+8} & \text{if } x < 3 \\ x^2 - 5x + 4 & \text{if } x \geq 3 \end{cases}$.