MAT 121-G81-G82 Final Test – Fall, 2014 Name_____
200 Points Comprehensive NO GRAPHING CALCULATORS!!!

1. For each of the following functions, state the domain in interval notation.

a. (5 pts) $f(x)=\sqrt{3x-7}$

b. (5 pts) $g(x)=\dfrac{x^2-4x+3}{3x-7}$

c. (5 pts) $h(x)=\sqrt{\dfrac{(4x-16)(x-1)}{(2x-5)(x+3)}}$

d. (5 pts) $w(x)=\log_4\left(\dfrac{(4x-16)(x-1)}{(2x-5)(x+3)}\right)$

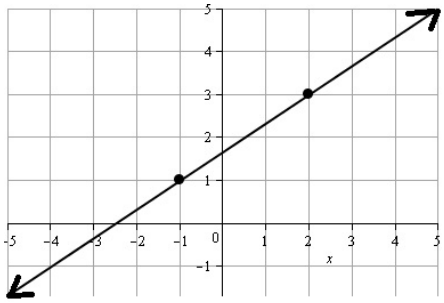
2. (10 pts) What is the average rate of change of the function $f(x)=x^2+5$ from $x=1$ to $x=3$?

3. The domain of $f(x)=\sqrt{x-1}$ is $[1,\infty)$ and the domain of $g(x)=\dfrac{2x-4}{x+2}$ is $(-\infty,-2)\cup(-2,\infty)$,

   a. (5 pts) Find $\dfrac{f}{g}$ and determine its domain. Do not simplify $\dfrac{f}{g}$.

   b. (5 pts) Find $f \circ g$ and determine its domain. Do not simplify.

4. (10 pts) Use the points marked as dots to derive an equation of the line from its graph.



5. (10 pts) Graph $g(x) = -2\sqrt{-3x+6}+5$ by the techniques of shifting, stretching, compressing or reflecting. Start with the graph of a basic function and show all steps *as demonstrated in Videos*. I expect to see 3 points labeled in the first sketch, and to see where those points are moved to in each subsequent step. I strongly recommend using $(0,0), (1,1),$ and $(4,2)$ as the 3 points. I'm looking for 5 graphs, with the first being the basic function, $f(x) = \sqrt{x}$, and the final being $g(x)$. *None* of the graphs, between the first and the last is going to be *either* $f(x)$ *nor* $g(x)$, so, for the last time, don't call 'em all $f(x)$! x- and y-intercepts for 5 bonus points.

6. Find all real and nonreal solutions of the following equations:

   a. (10 pts) $2x^2 - x - 10 = 0$

   b. (10 pts) $4x^2 - 12x + 10 = 0$

   c. (10 pts) $2x^4 - 2x^3 - 13x^2 + 28x - 15 = 0$

7. (10 pts) Based on your work on #6, provide a rough sketch of the graph of $f(x) = 2x^4 - 2x^3 - 13x^2 + 28x - 15$

8. Solve the following exponential and logarithmic equations. An exact answer is preferred. A decimal approximation is acceptable, if you are correct to the 5^{th} decimal place.

   a. (10 pts) $3^x = 97$

   b. (10 pts) $\log_4(x) = 97$

   c. (5 pts) $3 \cdot 5^x = 7^x$

   d. (10 pts) $\log_2(x^2 + 2x + 1) = 4$

9. Solve the absolute value inequality. Give you final answer in set-builder and interval notation.

   a. (15 pts) $|2x - 7| > 11$

10. (15 pts) Find the sum: $3 - 6 + 12 - 24 + \cdots\cdots + 768$

11. (15 pts) Solve the system of linear equations:
$$\begin{aligned} x - 5y + 13z &= -35 \\ 3x - 14y + 37z &= -98 \\ 4x - 18y + 49z &= -127 \end{aligned}$$
.

12. (10 pts) Write the equation for "The half-life of the radioactive isotope, Freakazoidium-99, is 450 years," and solve the equation for the decay constant, *k*.

13. (10 pts) Based on your work, how much radioactive Freakazoidium remains in a 512-kilogram sample, after 3600 years? (You can logic this one out, but I'm *looking* for something based on your previous work.)