MAT 121-G11 Test 4 Take-Home – Fall, 2014 Name_____
60 pts
Due Monday, November 17th. I will have *zero* patience for stapling during class time. I will have zero tolerance for late work.

Use separate paper to do the work on this take-home test. Make sure your pencil work is *dark*. It's a struggle for me to read faint print, and I'm done with it costing *me* time and stress. If I can't read it, easily, that's a zero, and I'm moving on.

1. (5 pts) Starting with $f(x)=4^x$, sketch the graph of $g(x)=2\cdot 4^{-3x-3}-9$ in 5 steps (counting $f(x)=4^x$ as the first step). Use x = - 1, x = 0, and x = 1 to find 3 points in the first graph, and show how these 3 points are moved around by each step in the transformation to $g(x)$. Include asymptote and the x- and y-intercepts. Give *exact* coordinates for intercepts, then round to 4 decimal places.
2. (5 pts) Starting with $h(x)=\log_4(x)$, sketch the graph of $w(x)=-2\log_4(x+9)-7$ in 4 steps (counting $h(x)=\log_4(x)$ as the first step.) Use x = ¼, x = 1, and x = 4 to find 3 points in the first graph, and show how these 3 points are moved around by each step in the transformations to $w(x)$. Include asymptote and the x- and y-intercepts. Give *exact* coordinates of intercepts, then round to 4 decimal places.
3. Let $f(x)=\sqrt{2x+4}$ and $g(x)=\dfrac{x-2}{x-7}$.
   a. (5 pts) What is the domain of f?
   b. (5 pts) What is the domain of g?
   c. (5 pts) Write the function $\dfrac{g}{f}$. Do not simplify.
   d. (5 pts) Write the function $g\circ f$. Do not simplify.
   e. (5 pts) What is the domain of $\dfrac{g}{f}$?
   f. (5 pts) What is the domain of $g\circ f$?
4. Find the domain:
   a. (5 pts) $\sqrt{\dfrac{(x-3)(x+4)^2}{(x-8)^4(x+6)}}$
   b. (5 pts) $\log_3\left(\dfrac{(x-3)(x+4)^2}{(x-8)^4(x+6)}\right)$
5. (5 pts) Re-write $\ln\left(\dfrac{\sqrt[5]{x^2y}}{t^{3/4}}\right)$ as a sum or difference of multiples of (simpler) logarithms.
6. (5 pts) Re-write $3\log_4(x^2)-\log_4(x^3)+2\log_4(\sqrt[4]{x})$ as a single logarithm.
7. (5 pts) The half-life of a radioactive isotope is 100 years. How old is a sample of that isotope if 93% of it has decayed into other by-products?
8. (5 pts) How much should I put into an account earning 7% APR, compounded weekly, if I want to have $10,000 in the account in 5 years?

1. **BONUS** (5 pts) Find the inverse function for $f(x)=\sqrt{2x-6}+1$. Then state the domain and range for both f and f^{-1}.

2. **BONUS** (5 pts) Re-write the function $g(x)=5x^2+10x-19$ in the form $g(x)=a(x-h)^2+k$. State the vertex of this parabola.