MAT 121-Online Test 4 – Spring, 2015 Name_____
100 Points Covers Chapter 4
Instructor: Harry S. Mills No Graphing Calculator

Date, Time:

Do your own work on separate paper. Leave plenty of margin and plenty of room around your work. I'm not impressed if you squeeze more work into a smaller space. To the contrary. At the end, please make sure your problems are in order. I'm too old and ornery to want to go on a scavenger hunt to award you points.

1. (20 pts) Starting with $f(x)=2^x$, sketch the graph of $g(x)=-3\cdot 2^{x+5}+9$ in 4 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 $g(x)$. Finding the x- and y-intercepts is a separate problem, so don't worry about them, on this page. Label each sketch as some variation on $f(x)$, for instance, $7\cdot 2^{x-11}-4$ would be $7f(x-11)-4$.

2. (10 pts) Let . Find the x- and y-intercepts for this function, rounded to 4 decimal places. For 5 bonus points, label these intercepts on your final graph for #1.

3. Let $f(x)=\sqrt{3x-6}$ and $g(x)=\dfrac{x+10}{x+4}$.
   a. (5 pts) What is the domain of f?
   b. (5 pts) What is the domain of g?
   c. (5 pts) Write the function $\dfrac{f}{g}$. Do not simplify.
   d. (5 pts) What is the domain of $\dfrac{f}{g}$?
   e. (5 pts) Write the function $f\circ g$. Do not simplify.
   f. (5 pts) What is the domain of $f\circ g$?

4. Find the domain:
   a. (5 pts) $\sqrt{\dfrac{(x+3)(x-9)^2}{(x-13)^3(x-5)^2}}$. (Sign Pattern!)
   b. (5 pts) $\log_3\left(\dfrac{(x+3)(x-9)^2}{(x-13)^3(x-5)^2}\right)$ (Reinterpret previous sign pattern in the current context!)

5. (10 pts) Solve $\log_7(2x+3)+\log_7(x-3)=\log_7(4x+6)$.
6. (10 pts) Solve $3^{x^2-12}\cdot 3^{-2x}=27$
7. (10 pts) The half-life of a radioactive isotope is 950 years. Find how old a sample is, if 82% of the isotope in an ancient manuscript has decayed (i.e., if only 18% of the radioactive isotope remains.). Give this answer to the nearest year.

Solve any two (3) Bonus problems for up to 15 points. I'll grade the first two I come to.

1. BONUS (5 pts) Solve the equation $2 \cdot (1.3)^x = 5 \cdot (1.1)^x$. Give an exact answer and a decimal answer, rounded to 4 places.

2. BONUS (5 pts) Solve the absolute value inequality $|2x - 7| \geq 8$. Use a number line and either union or intersection ('and' or 'or') to find the solution.

3. BONUS (5 pts) The absolute value inequality $|2x - 7| \geq -8$ is always true, since absolute value can never be negative. But show the steps and manage your and's and or's, with a number line graph at the end to interpret what the algebra is telling you.

4. BONUS (5 pts) The absolute value inequality $|2x - 7| < -8$ is never true, since absolute value can never be negative. But show the steps and manage your and's and or's, with a number line graph at the end to interpret what the algebra is telling you.

Slope = $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ and $y = m(x - x_1) + y_1$

Continuous growth/decay/compounding: $A(t) = A_0 e^{kt}$

Periodic Compounding: $A(t) = A_0\left(1 + \dfrac{r}{m}\right)^{mt}$ or $= P\left(1 + \dfrac{r}{m}\right)^{mt}$ or $= P(1+i)^n$.

$ax^2 + bx + c = 0 \Rightarrow x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$ax^2 + bx + c = a(x-h)^2 + k$, where $(h,k) = \left(-\dfrac{b}{2a},\ f\left(-\dfrac{b}{2a}\right)\right)$

Difference Quotient = $\dfrac{f(x+h) - f(x)}{h} = \dfrac{f(x_2) - f(x_1)}{x_2 - x_1}$ = average slope.

$a + ar + ar^2 + \cdots + ar^{n-2} + ar^{n-1} = \sum_{k=1}^{n} ar^{k-1} = a\left(\dfrac{1-r^n}{1-r}\right)$ or $a\left(\dfrac{r^n - 1}{r-1}\right)$

If $|r| < 1$, then $a + ar + ar^2 + \cdots\cdots + ar^{n-2} + ar^{n-1} + \cdots\cdots = \sum_{k=1}^{\infty} ar^{k-1} = a\left(\dfrac{1}{1-r}\right)$