Calc II Recitation D **Name: _____**

Recitation Two: 7/2/2015

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Objectives:
1. Inverse Derivatives (Quickly)
2. Limits
3. L'Hopitals & Indeterminate Forms
4. More Definition of Derivative Proofs (Yay! BUT only if time permits)

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1. Inverse Derivatives

i. What are inverse functions?

ii. Remember Quick Proof of Derivative (From Lecture):

Logarithmic Derivative (Review for viewing pleasure)

GOAL:

$D_x[ln(u)] = \frac{1}{u} * (\frac{du}{dx})$

$g'(x) = \frac{1}{f'(g(x))} = \frac{1}{x}$

1) $f(x) = e^x$ & $g(x) = ln(x)$ (Are Inverse FUNCTIONS!! WHOO!)

2) $g'(x) = \frac{1}{f'(g(x))}$ (Definition of Derivative of Two Inverse Functions)

3) $f'(x) = e^x$ & $f'\big(\mathrm{g(x)}\big) = f'(\ln(x)) = e^{lnx} = x$

4) $g'(x) = \frac{1}{f'(g(x))} = \frac{1}{x}$ (CORRECT!!! SWEET!)

Properties of Logs Again!:

1. $lnx^y = ylnx$

2. $\ln\left(\frac{x}{y}\right) = \ln(x) - \ln(y)$

3. $\ln(xy) = \ln(x) + \ln(y)$

4. $\ln\left(\frac{1}{x^n}\right) = \ln(x^{-n}) = -n\ ln(x)$

Example One:

You are on a slanted surface with a group of friends. 500 meters up the hill is a lone man next to a trap door. You also have a trap door next to your group. The doors require a password to unlock (**which WOW! Just happens to be the derivative of the function below!**). Unfortunately a giant boulder is rolling down the hill at you. You see the man frantically try to answer the problem then enter it in the door. He gets it wrong and is squished in a horrible burst of gore (lol? Noo Matt just nooo…) Can you guys save yourselves in time? You have 30 seconds. Answer must be written by a team representative within the time frame for team survival. Which team will survive? Da da daaaaaa… (Suspense ensues)

$\boldsymbol{f(x) = ln(u * v * \frac{w}{p * q * r})}$

i. What is a limit?

ii. Proper Limit Notation (Aye it matters)

BUT MATT?! WHERE IS THE PRACTICE??!! WE WANT PRACTICE!!

-REALLY?!! YOU DO? (So proud ☺)

- Practice will be forthcoming sooon (BWAHAHAHAHA)

L'Hopital's Rule (What a real standup guy making cool rules and stuff)

i. General Idea (equations and what not)

ii. Proof:

iii. Indeterminate Forms:

Normal Indeterminate Forms:

Hidden Indeterminate Forms:

Questions:

1. Which of the following are indeterminate forms?

a. $\frac{0}{0}$ b. $\frac{\pm\infty}{\pm\infty}$ c. $0 * \infty$ d. 0^0 e. $\infty - \infty$ f. 1^∞ g. ∞^0

2. YO is $\infty + \infty$ an Indeterminate? (☺) NO!!!! LOL

- Here's why:

3. So when do I use L'hopitals?
   - GOOD QUESTION!!!!
   -When you get an indeterminate

Procedure:

1.

2.

3. (If Indeterminate):

4.

5.

6.

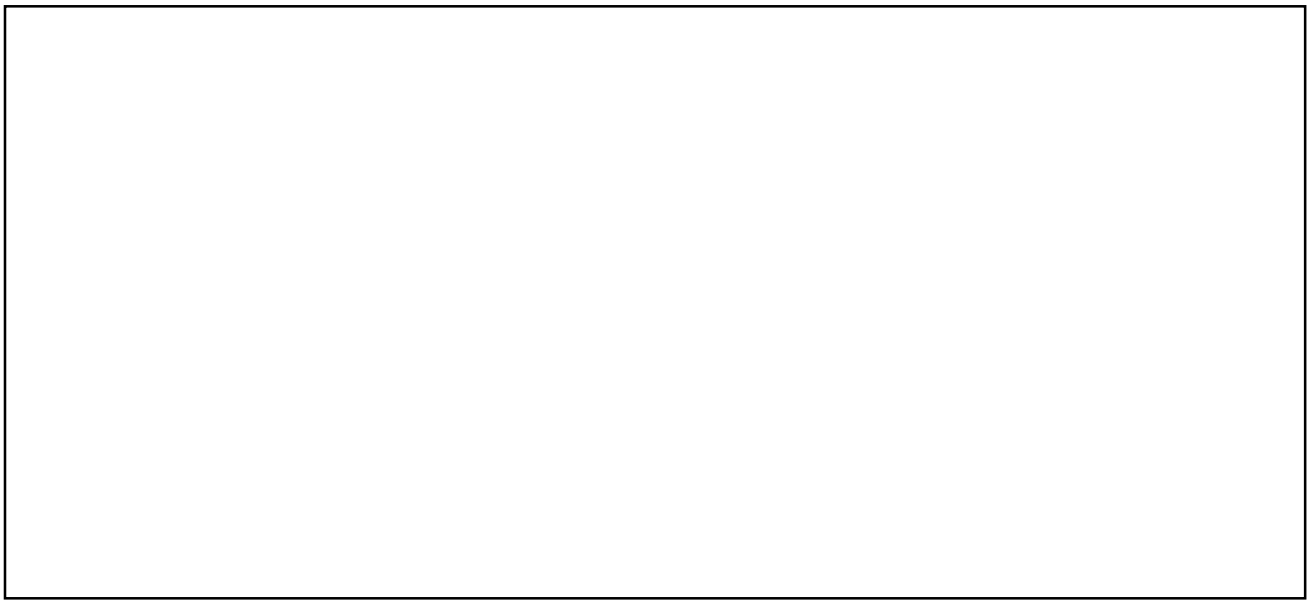
Finally! Some Practice! Thank Goodness ☺!

Example Two:
Evaluate the following limit

$$\lim_{x\to 0}\frac{(e^x - x - 1)}{x^2}$$

Evaluate the following limit:

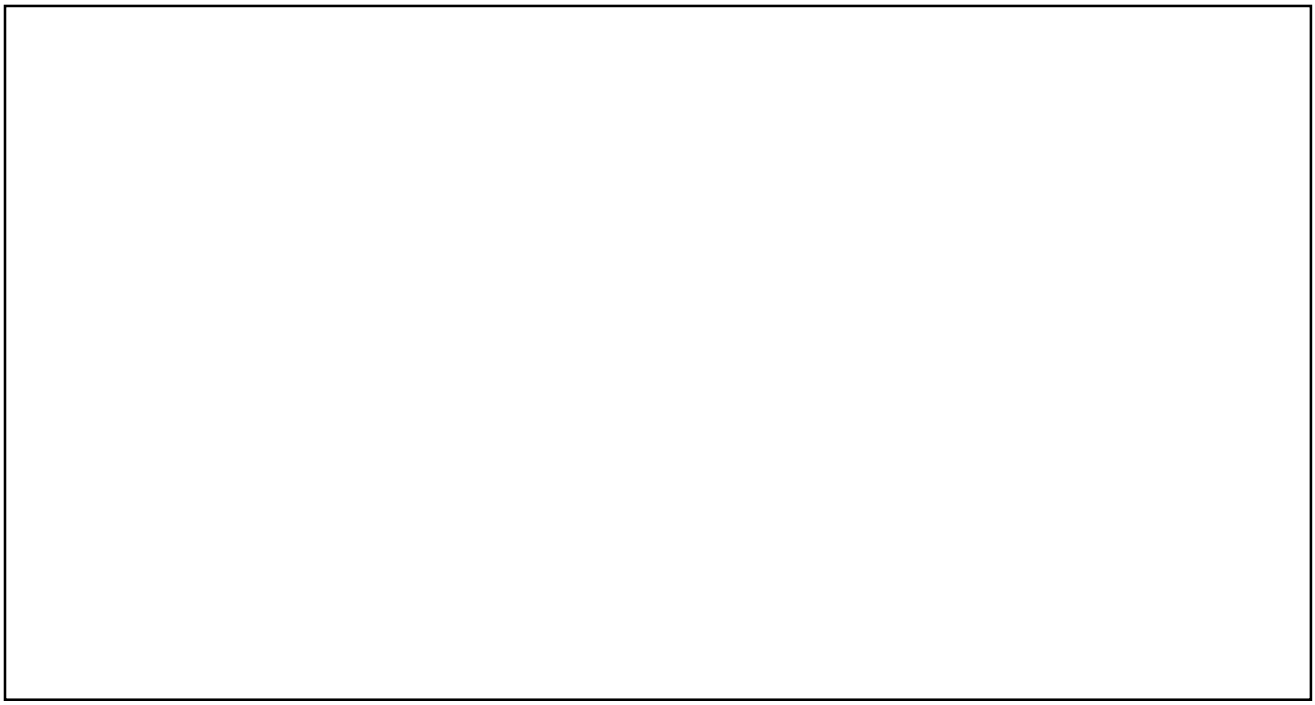
$$\lim_{x\to\infty} \frac{\sqrt{x^2-1}}{\sqrt{4x^2-1}}$$



Example Four:

Evaluate the following limit:

$$\lim_{x\to 0} \frac{2^x-1}{3^x-1}$$



Maaaatttttttt give us a fun word problem Matttt
-Well okay Carl's friend

Example Five:
Carl the Llama is up to his evil tricks again and has taken you and your friends as hostages, whom he intends to eat. You notice that the lock holding you in the padded room, once it has been degrimmed, has a keypad that takes fractions. It must be the way out!? But what is the combination?!! Who knows?! You frantically look around the cell room and realize that on the walls there is a limit written all over. It was difficult to spot because it was written so many times on top of each other. Good thing you like calculus so much ☺ so you know what to do. **Evaluate!?** Can you do it before Carl comes back to eat your hands? You must also put up with Paul's screaming CAAARRRL!!! Over and Over. You have 4 minutes to figure out an answer and write it on the board**. Will your team make it?!!**

$$\lim_{x \to \infty} \left(\frac{3x+1}{3x-1}\right)^{x^2}$$

Example Six:
Evaluate the Limit:

$$\lim_{x\to 0^+} xlnx$$

*If time we will review Definition of Derivative proof for Tangent (Important)