Homework: http://math.mnrt.net/

Name _____Date_____ _____ raw _____ percent

Calculus I Trimester 3 Final Exam (180 Points)

■ **This is a take home exam. Here are the rules:**

The exam is due by 10:15 AM, Wednesday, June 6, 2012. You may turn it in sooner, if you wish. Turn it in by leaving it either on my desk in office #116 or on my table in classroom #125.

You may
[1] use your book, your notes, and a calculator while doing the exam,
[2] use any other book while doing the exam,
[3] use the internet to learn more about these topics while doing the exam,
[4] discuss the questions with a classmate or with anyone else who is *not* at a higher level of mathematics than you are. The solutions turned in must be your own work.

■ **Any questions about these rules, just ask me at any time. If you believe there is an error in a question, ask me about it.**

■ **Please work out your solutions as rough drafts on paper other than this exam paper. When you turn in this exam (on this paper) it should be your final draft of your best work. If I must exercise more than ordinary effort to figure out what you are saying, either because your penmanship or mathematical exposition is unclear, you will not receive full credit.**

■ **Partial credit is given. It is to your advantage to write clear, complete, and concise solutions. Show as much detail as would be needed for a good student at your level to understand your work.**

■ **Calculators are allowed, but only exact answers count. If the answer is $\sqrt{2}$, then $\sqrt{2}$ gets credit and a decimal approximation such as** 1.4142135623730950488 **gets no credit.**

■ **Answers must be completely simplified. No denominators may include radical or complex numbers. All fractions reduced. Simple arithmetic must be completely performed; e.g. write 9 instead of $\sqrt{81}$ and $i\sqrt{7}$ instead of $\sqrt{-7}$.**

■ **A. Answer the following. (20 points each).**

[1] Find the limit, if it exists. If the limit does not exist, explain why. $\lim_{x \to 0} \frac{x}{\sqrt{1+3x}-1}$.

[2] Find the limit, if it exists. If the limit does not exist, explain why. $\lim_{x \to 0} \frac{\tan 3x}{3 \tan 2x}$.

[3] Find the limit, if it exists. If the limit does not exist, explain why. $\lim_{x\to\infty} \frac{3x^2-x-2}{5x^2+4x+1}$.

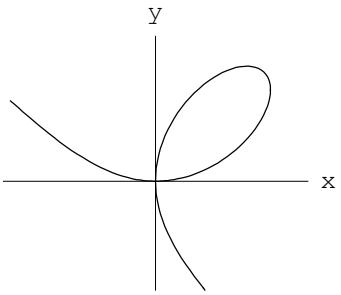
[4] Find the value of the constant c that makes g continuous on $(-\infty, \infty +)$.

$$g(x) = \begin{pmatrix} x^2 - c^2 & \text{if} & x < 4 \\ c\,x + 20 & \text{if} & x \geq 4 \end{pmatrix}$$

[5] Find $\frac{dy}{dx}$ if $y = \sin\left(\tan\sqrt{\sin x}\right)$.

[6]

The curve below is called the folium of Descartes. The equation of this curve is $x^3 + y^3 = 3xy$. Find the equation of the line tangent to the folium of Descartes at the point $\left(\frac{3}{2}, \frac{3}{2}\right)$.



[7] Evaluate the indefinite integral. $\int \sec x \tan x \sqrt{1+\sec x}\, dx$.

[8] Evaluate the definite integral. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} x^2 \sin^2(x^3) \cos(x^3)\, dx$.

[9] The region bounded by the curves $y = x$ and $y = x^2$ is rotated about the y-axis. Find the volume of the resulting solid.