Math 222 Quiz 1

September 9, 2010

Your Name: *Your Section:*

Instructions: You have 20 minutes to solve the following problems and the total score is 10 points. You can answer in attached papers if you like. There is an extra problem on the back, whose points will be regarded as bonus, but I want to remind you that it's difficult.
Some formulas:
$\int \frac{1}{\sqrt{a^2-u^2}}\mathrm{d}u = \sin^{-1}(\frac{u}{a}) + C \qquad \int \frac{1}{a^2+u^2}\mathrm{d}u = \frac{1}{a}\tan^{-1}(\frac{u}{a}) + C$
$\int \frac{1}{u\sqrt{u^2-a^2}}\mathrm{d}u = \frac{1}{a}\sec^{-1}|\frac{u}{a}| + C$

1. Complete **ONE** of the formulas below.(3 points)
   $\int \sec u \tan u \mathrm{d}u \qquad \int \tan u \mathrm{d}u$

2. Find the integrals below. (7 points)

   (a) $\int_{\pi/4}^{\pi/3} \sec^2 y e^{\tan y}\mathrm{d}y$ (4 pts)

   (b) $\int \frac{x^4}{1+x^2}\mathrm{d}x$ (3 pts)

3. Extra problem

Instructions: This is the extra problem, whose points can add to the total score. However,the total score won't be more than 10 points.
Find a way to calculate $I_k = \int \tan^{2k+1} x \mathrm{d}x$, where k is a nonnegative integer.
Hint: Find the relationship between I_k and I_{k-1} when $k \geq 1$, and you may want to use the relationship between $\sec x$ and $\tan x$ (5 pts)