Exam 2 Calc 2 10/14/2005

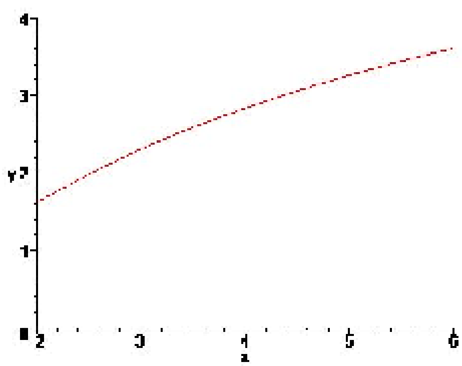
Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Evaluate $\int xe^x \, dx$.

2. **Set up** an integral for the length of the curve $y = \cos x$ on the interval $0 \le x \le 2\pi$.

3. Evaluate $\int \sin^3 x \cos^2 x\,dx$.

4. When $\int_2^6 \ln\left(1+x^2\right)dx$ is approximated, $L_{10} \approx 10.637$, $R_{10} \approx 11.438$, and $M_{10} \approx 11.047$.



a) What is T_{10}, to three decimal places?

b) Which of these four approximations can you be certain is higher than the true area under the curve, and why?

5. **Set up** integrals for the x coordinate of the center of mass of the region bounded by the curves $y = \sqrt{x}$ and $y = x$.

6. Derive the integration formula $\int \frac{du}{\sqrt{a^2 - u^2}} = \sin^{-1}\frac{u}{a} + C$.

7. Evaluate $\int_0^5 \frac{1}{(2x-8)^3}\,dx$.

8. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Dang, these trig integrals kick my butt. The sin and cos ones I was kinda getting, but then the tan and sec ones just blew me away. I was thinking it was about the same, like if you look for which one has an odd exponent or whatever, you know? But I tried the homework and that totally didn't work. How the heck do you even start those?"

Explain clearly to Biff how to approach integrals involving secant and tangent.

9. If $p(t) = \begin{cases} 0 & \text{if } t < 0 \\ 0.4e^{-0.4t} & \text{if } t \geq 0 \end{cases}$ is the probability density function for the number of minutes it takes Jon to find his pen after he starts looking for it,

a) Find the probability, to the nearest hundredth, that Jon finds his pen within 1 minute of beginning his search.

b) Find, to the nearest tenth of a minute, the median time it takes Jon to find his pen.

10. Evaluate $\int \frac{2}{\left(x^2+1\right)\left(x-1\right)}dx$.

Extra Credit (5 points possible):

Find the value of the constant C for which the integral $\int_0^\infty \left(\frac{x}{x^2+1}-\frac{C}{3x+1}\right)dx$ converges.