Exam 2 Calc 2 10/15/2009

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

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

2. Evaluate $\int_1^\infty \frac{1}{x^2} \, dx$.

3. Write an integral for the length of the curve $f(x) = x^3$ between the points (1,1) and (2,8).

4. Evaluate $\int \tan^2 q \sec^4 q \, dq$.

5. Show that $\int \frac{\sqrt{x+4}}{x}\,dx$ can be transformed into $2\int \frac{u^2}{u^2-4}\,du$.

6. Show that the surface area of a sphere with radius r is $4\pi r^2$.

7. Biff is a calculus student at Enormous State University, and he's having some trouble. Biff says "Dude, some of this calculus stuff is totally screwed, like they're just trying to make it hard, you know? There was this one problem the guy did in class, and he was, like, making a big deal about it, right? But so he just found the circumference of a circle is $2\pi r$, which I knew from, like, middle school. But so what I really don't get is that he was making a big deal about it being one of the improper integral things, you know? Like that you've gotta do the b approaches something stuff on it? But I don't get that, 'cause I did it without that and got the right answer, and it's not like it had infinity for one of the limits or anything. So why do you have to do that special stuff?"

   Explain clearly to Biff why this integral is improper, and also why ignoring that still got him the right answer.

8. Derive Line 37 from the table of integrals.

9. Evaluate $2\int \frac{u^2}{u^2-4}du$.

10. Jon plans to build a triangle. He wants it to have a base of length 1 and height of 1, so he's thinking of it with vertices at (0,0), (1,0), and (a,1). He wants it to be unstable, meaning that the x coordinate of the center of mass must not be located over the base – in everyday terms, he wants it to tip when set on that base. What values of a accomplish this?

Extra Credit (5 points possible):

Consider the solid obtained by revolving around the x axis the region under $y = 1/x$ but above $y = 0$, to the right of $x = 1$. What are the volume and surface area of this solid?