Exam 2 Calc 2 2/19/2016

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

1. Evaluate $\int x \cos x \, dx$.

2. Give the form for a partial fractions decomposition of $\int \frac{x^2 - 4}{(x-5)^3 (x^2+1)} dx$, or explain why one does not exist.

3. What trigonometric substitution is a good idea for evaluating $\int \frac{1}{\sqrt{x^2+9}}\,dx$? [No, you don't need to work it out – just name the good substitution.]

4. Evaluate $\int \tan^6\theta \sec^2\theta\, d\theta$.

5. Evaluate $\int_{8}^{-8} \frac{1}{|x|^{2/3}}\,dx$

6. Derive the reduction formula $\int \sin^n \theta \, d\theta = -\frac{1}{n} \sin^{n-1} \theta \cos \theta + \frac{n-1}{n} \int \sin^{n-2} \theta \, d\theta$.

7. Bunny is a Calculus student at Enormous State University, and she's having some trouble. Bunny says "Ohmygod! These integration technics are soooo hard! There was this one problem where I tried, like, a substitution, but the tutor Daddy hired for me said that wasn't good because there wasn't an x in the numerator. How can that even be, that a problem is easier if there's an extra x in it?"

   Help Bunny by giving a good example of an integral which is easier if the function has an x included in the numerator, and explaining why that makes it easier.

8. Evaluate $\int \frac{\left(x^2+11x\right)dx}{(x-1)(x+1)^2}$.

9. Set up an integral and evaluate it to find the volume of the solid resulting from rotating the region between $y = \sin x$ and the x-axis on the interval $[0, \pi]$ around the x-axis.

10. Evaluate $\int \frac{x^2}{\sqrt{a^2 - x^2}} dx$. [Hint: If it's too daunting with the a, do it with a 1 there.]

Extra Credit (5 points possible): Evaluate $\int \frac{1}{a^3 + u^3} dx$. [Hint: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$]