Math Xb Spring 2004

Lab 9: The Substitution Rule

April 27, 2004

Name _____

Section Instructor _____

Collaborators _____

_____

In today's lab, you will create several integrals, each of which can be evaluated by using the Substitution Rule. You can think of yourself as a calculus teacher, creating test questions on the Substitution Rule for your students.

For example, suppose you want an integral that becomes

$$\int \cos u \, du$$

after performing a substitution. If you let $u = x^3 + x$, then $du = (3x^2 + 1) \, dx$ and so

$$\int \cos u \, du = \int \cos(x^3 + x) \cdot (3x^2 + 1) \, dx.$$

If you were to give the integral

$$\int (3x^2 + 1) \cos(x^3 + x) \, dx$$

to your students, they would need to use the Substitution Rule to evaluate it.

Your task is to create six integrals that require the Substitution Rule for evaluation. For each each integral, pick a different simplified form from the following list.

- $\int u \, du$
- $\int \dfrac{1}{u} \, du$
- $\int e^u \, du$
- $\int \sin u \, du$
- $\int \sec^2 u \, du$
- $\int \dfrac{1}{1 + u^2} \, du$

Also for each integral, also pick a different type of function for the u-substitution from the list below.

- a polynomial
- a rational function
- a trig function
- a function involving a square root
- a function involving a logarithm
- a function involving an exponential

After creating your list of six integrals, trade lists with someone else in your lab and solve the integrals they created. Turn in both your list of integrals and your solutions to your partner's list.