Calculus II, Spring 2005 — Math 131-01
Lab 3 — February 1

Suggested Practice Exercises: *Not to be turned in. You need to be able to do integration by substitution pretty quickly and to recognize when this method is applicable. For practice, do as many of the odd-numberd problems numbered 1 to 91 in Section 4.5 as you can find time for. Here are a few more problems that you can do for warm-up in lab:*

a) $\int x^3 e^{x^4}\,dx$ **b)** $\int \sec^2(5\theta)\,d\theta$ **c)** $\int \frac{\sin(\sqrt{x})}{\sqrt{x}}\,dx$

d) $\int \sin(2t)\sqrt{\cos(2t)+1}\,dt$ **e)** $\int e^x(e^x+1)^5\,dx$ **f)** $\int e^x(e^{3x}+1)\,dx$

Exercises to hand in: *Please hand in your responses to the following exercises. You should work on these problems in a group and turn in a single solution for the entire group.*

1. Consider the integeral $\int \sin(x)\cos(x)\,dx$. Integration by substitution can be applied to this problem in two ways: (a) Let $u = \cos(x)$ or (b) Let $u = \sin(x)$. Compute the integeral using each of these substitutions. Then **explain** how there can be what look like two different answers for one problem.

2. Sometimes the substitution that will work on an integral is not obvious. Letting u be a linear function sometimes works. Use the substitution $u = x + 4$ to compute the integral

$$\int \frac{2x+1}{\sqrt{x+4}}\,dx$$

You will need to do some algebraic manipulation. Show all your work! (This is problem number 90 from page 332 in the textbook, and it refers to Example 5 on page 325 for the technique that is used.)

3. In each of the following problems, fill in the box with a *non-zero* function that will make the integral doable. Then find the resulting integral.

a) $\int \boxed{} \cdot \sin(x^2+3x+7)\,dx$ **b)** $\int \sqrt{x}\cdot e^{\boxed{}}\,dx$

c) $\int \sqrt[3]{\boxed{}} \cdot (3e^{3x}+3e^{-3x})\,dx$ **d)** $\int \frac{\boxed{}}{\sec^2(x)+3}\,dx$