SECTION 5.5: SUBSTITUTION (I.E. UNDOING THE CHAIN RULE)
INSTRUCTOR NOTES

This sheet is flexible and will take at least one day. It can be longer or shorter depending on how much the instructor does and how much is left exclusively to group work.

Things to emphasize.

- Begin by pointing out that they can always tell if a definite integral is correct via differentiation. Point out that this implies that guess-and-check is always a strategy.
- Instructor does #1: Emphasize that you are taking an integral in x and *completely* rewriting it in terms of u including the du-part. Observe that it is the du-part that is helping you undo the chain rule.
- Students do #3-6 and get complete solutions on the board. Check them.
- Instructor does #7 in two ways. (way 1: Keep limits for x; way 2: Shift limits to u) Emphasize that both approaches are important. Point out that you do not want to have only one way to get out of your house in a fire. Same principle in mathematics.
- Require that students do #8 in *both* ways. Get solutions on the board and check them both.
- Get them to make an attempt at #9. Help if needed.
- Go in with some extra problems if time permits. Some examples:

  $\displaystyle\int \left(5 + x^2 + \frac{x^2}{x^3+1}\right)\, dx$

  $\displaystyle\int \left(\sec^2(x/2) + \cos(\pi x)\sin^2(\pi x)\right)\, dx$

  $\displaystyle\int (k + rs)\, ds$