DR. MANDI'S LECTURE OUTLINE
SECTION 5.5 REVIEW: EVALUATING INTEGRALS USING SUBSTITUTION

Example 1. How would we evaluate $\int 3(x+2)^2 dx$?

Example 2. Evaluate $\int 2x\cos(x^2)dx$.

***Substitution can be used to undo the _____!!!

Date:

It utilizes the fact that if $u(x)$ is a function of x, then

$$du = \frac{du}{dx}dx$$

The Substitution Rule (or Change of Variables)

If $u(x)$ is a differentiable function and f is continuous on the _____, then

$$\int f(u(x))u'(x)dx =$$

Example 3. Find $\int 2\sin(2x)dx$.

Example 4. Find $\int \cos(2x)dx$.

Steps For Substitution

(1) Identify a convenient _____

(2) Take $du =$

(3) Rewrite ALL x-values in terms of u

(4) Integrate! (For indefinite integrals, don't forget the _____)

(5) Rewrite in terms of _____, if applicable.

Example 5. Determine $\int x(x^2+5)^8 dx$.

Example 6. Determine $\int \tan x dx$.

Example 7. Determine $\int \frac{x}{(1+x^2)^2} dx$.

Example 8. Determine $\displaystyle\int_0^3 \frac{x}{(1+x^2)^2}dx$.

Substitution for Definite Integrals

$$\int_a^b f(u(x))u'(x)dx =$$

Example 9. Evaluate $\int_0^{\pi/4} \tan x \sec^2 x dx$.

Example 10. Evaluate $\int y\sqrt{y+1}dy$.

Example 11. Find the area between $f(x) = x\sqrt{4 - x^2}$ and the x-axis on $[-2, 2]$.

Example 12. Find the area of the region below $y = 2$ and above $y = x^2 - 2$.

Example 13. Evaluate the following:

- $\displaystyle\int_{-2}^{1} \frac{dx}{(x-9)^2}$
- $\displaystyle\int \frac{tdt}{\sqrt{t+1}}$
- $\displaystyle\int \cos(5\theta)\sin^3(5\theta)d\theta$