Monday Night Calculus

The Method of Substitution

Exercises

1. Evaluate the indefinite integral.

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

(b) $\int \tan x \, dx$

(c) $\int \dfrac{e^{\sqrt{x}}}{\sqrt{x}} \, dx$

2. **(a)** Find $\int 2 \tan x \sec^2 x \, dx$ using the substitution $u = \tan x$.

(b) Find $\int 2 \tan x \sec^2 x \, dx$ using the substitution $u = \sec x$.

(c) Graph $y = \tan^2 x$ and $y = \sec^2 x$ in the same viewing window. These functions are clearly different. Explain this observation in connection with parts (a) and (b).

3. Find $\int (x^2 + x)\sqrt{2 - x} \, dx$

Hint: If $u = 2 - x$, then $x = 2 - u$.

4. Suppose $g(x) = f(7 - 5x)$ and $\int_2^3 g(x) \, dx = c \int_a^b f(x) \, dx$.

Find the values of a, b, and c.

5. Suppose f is a differentiable function such that $f(1) = 2$ and $f(2) = 3$.

(a) Find $\int_1^2 f'(x) \, dx$

(b) Find $\int_1^2 f(x) f'(x) \, dx$

(c) Find $\int_1^2 \dfrac{f'(x)}{f(x)} \, dx$