

4.5 - The Substitution Rule

4.5a

The Substitution Rule

If $u = g(x)$ is a differentiable function whose range is an interval I and f is continuous on I , then

$\int f(g(x)) g'(x) dx = \int f(u) du$ This is the reverse of the Chain Rule for differentiation.

Exercises:

Evaluate.

$$\int x^2 \sin(x^3) dx$$

4.5b

$$\int y^2 (4 - y^3)^{2/3} dy$$

$$\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$$

$$\int \sin x \sin(\cos x) dx$$

$$\int \frac{dt}{\cos^2 t \sqrt{1 + \tan t}}$$

4.5c

$$\int_0^{\sqrt{\pi}} x \cos(x^2) dx$$

$$\int_0^a x\sqrt{a^2 - x^2} \, dx$$

4.5d

$$\int_{-\frac{\pi}{3}}^{\pi/3} x^4 \sin x \, dx$$

$$\int x\sqrt{x+2} \, dx$$

$$\int x^2\sqrt{2+x} \, dx$$