

**Sections 5.5: The Substitution Rule**

Knowing  $f(x) = (x^3 + 2)^4$  and  $f'(x) = 4(x^3 + 2)^3 * 3x^2 = 12x^2(x^3 + 2)^3$

Compute  $\int 12x^2(x^3 + 2)^3 dx =$

Example: Compute.

$$\int 2x(x^2 + 5)^8 dx =$$

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

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

Example: Compute the following.

A)  $\int \cos(5x) dx =$

$$\text{B) } \int 2x^3(x^4 + 7)^5 dx =$$

$$\text{C) } \int \frac{12x^3 + 9}{(x^4 + 3x)^5} dx$$

$$\text{D) } \int \frac{e^{2+\sqrt{x}}}{\sqrt{x}} dx$$

$$\text{E) } \int x(x-8)^8 dx$$

$$F) \int \tan(4x) dx$$

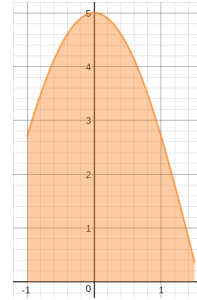
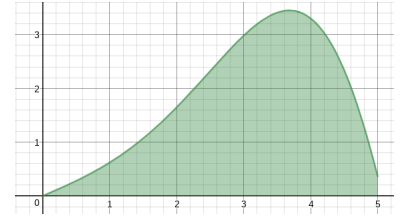
$$G) \int \frac{1+4x}{1+x^2} dx$$

**The substitution Rule for Definite Integrals** If  $g'(x)$  is differentiable on  $[a, b]$  and  $f$  is continuous on the range of  $g$ , then continuous on  $I$ , then

$$\int_a^b f(g(x))g'(x) dx = \int_{g(a)}^{g(b)} f(u) du$$

Example: Compute

$$\int_0^5 x \cos(0.1x^2 - 1) dx =$$



Example: Compute

$$\int_1^2 12x(2x^2 + 1)^3 dx =$$

Example: Compute

$$\int_0^4 xe^{-x^2} dx =$$