

## Substitution Rule

Each differentiation rule for functions provides a rule to find an antiderivative.

Each rule is rewritten into a method for finding integrals. This rewriting is called substitution.

U-Substitution is the next integration technique we will look at. It involves taking more complicated integrals and converting them into a more familiar form that makes for easier integration.

\*\* Integration by substitution (also called u-substitution or "The Reverse Chain Rule") is a method to find an integral, but only when it can be set up in a special way.

•

## Chain Rule (derivative)

$$\frac{d}{dx} f(g(x)) = f'(g(x))g'(x)$$

## Substitution Rule

$$\int f(g(x))g'(x)dx = \int f(u)du, \text{ where } u = g(x), \\ du = g'(x)dx$$

## Integration method (u-substitution)

Ex.  $\int \sqrt{x^2+7} \ 2x \ dx$

Ex.

$$\int (x^3-12)^{-4} x^2 dx$$

.

Ex.  $\int \frac{2x^4}{x^5+2} dx$

.

Ex.  $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

.

$$\int \tan^5 x \sec^2 x \, dx$$



$$\int \frac{\sin(\ln x)}{x} dx$$

$$\int x^2 e^{x^3} dx$$

.