Revisit: FTC Part 1 – Special Case

$$\frac{d}{dx}\int_{x^3}^{5} t^2 \; dt$$

Recall: Differentials

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

ex. Find the differential of: $y = x^3$

$$\left(ax^n\right)' = nax^{n-1}$$

Substitution Rule

Use the Substitution Rule to integrate when _____ AND

_____.

ex. Find $\int 2x\sqrt{1+x^2} \; dx$

$$\int ax^n dx = \frac{ax^{n+1}}{n+1} + C$$
where $n \neq -1$

Examples when *u* must first be manipulated:

ex. Find $\int \left(x^3+1\right)^5 \cdot 3x^2 \ dx$

ex. Find $\int \dfrac{x}{\sqrt{1-4x^2}} \ dx$

ex. Find $\int e^{5x} \, dx$

Do: Find $\int e^{5x} \, dx$ Do: Find $\int \dfrac{x}{1-6x^2} \, dx$

Integrate trigonometric functions using the Substitution Rule:

ex. $\int \tan x \; dx$

ex. $\int \cot x \csc x \; dx$

A different situation with u:

ex. Find $\int \sqrt{2x+1} \; dx$

Substitution Rule for Definite Integrals

Revisit: Evaluate $\int_0^4 \sqrt{2x+1} \, dx$

ex. Evaluate $\int_1^2 \frac{dx}{(3-5x)^2}$

ex. Evaluate $\displaystyle\int_{1}^{e} \frac{\ln x}{x}\, dx$