u-**Substitution**

Goal:
•   Can identify a function and its derivative in an integral
•   Understands substitution as reverse chain rule
Terminology:
•   Substitution

Discussion: Given a function $y = f(x)$, how would you identify that f is the derivative of another function after applying chain rule?

Our goal today is to find the antiderivative of more complex functions.

Example: Evaluate the following

$$\int (1 + \ln x)e^{x \cdot \ln x}\,dx$$

Practice: Evaluate the following

$$\int \frac{2x - 1}{x^2 - x}\,dx$$

Practice: Evaluate the following

$$\int \left(2 + \frac{1}{\sqrt{x}}\right)\sqrt{x + \sqrt{x}}\,dx$$

If we are measuring the area under a curve and we use substituion, we need to keep in mind that the bounds of the interval depend on x and if we substitute we need to substitute everything.

Example: Evaluate the following

$$\int_{e^{-1}}^{e} \frac{(1 + \ln x)^2 (1 - \ln x)}{x} dx$$

Practice: Evaluate

$$\int_0^1 x^3 \sqrt{x^2 + 1} dx$$

Practice Problems: 11.3 # 1b, 2, 3 (NOT e, g, L, n-r), 4 (NOT d, e)

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