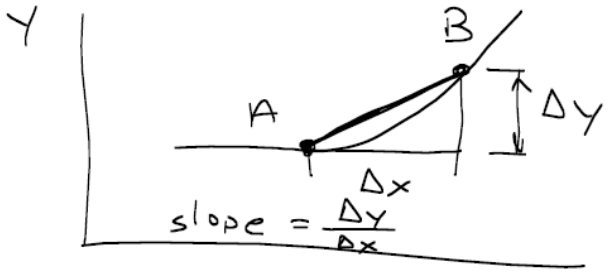
Derivatives and Integral

Derivative

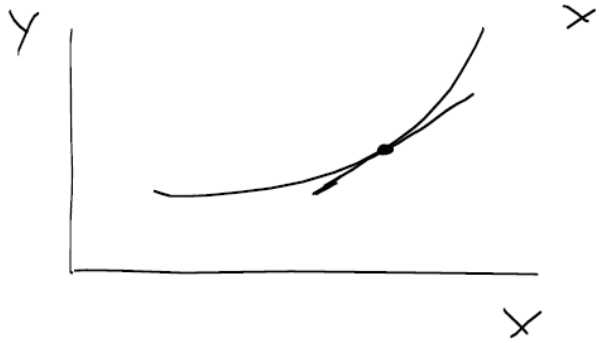
Slope → Average over a portion of a graph

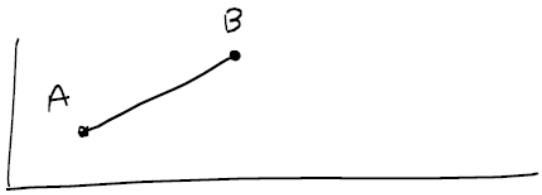


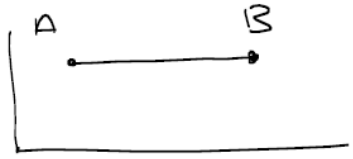
Derivative

Instantaneous slope at a point

$$\text{Derivative} = \frac{dy}{dx}$$







Power Rule for Derivatives

$$\frac{dy}{dx}\left(x^n\right) = n x^{n-1}$$

$$\frac{dy}{dx}\left(x^2\right) = 2x^1$$

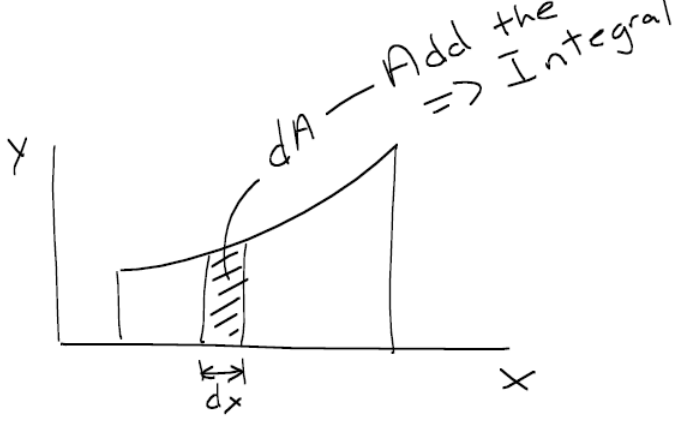
$$\frac{dy}{dx}(\text{constant}) = 0$$

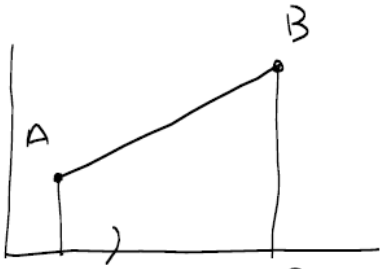
Exponential Function

$$\frac{dy}{dx}\left(e^{ax}\right) = a e^{ax}$$

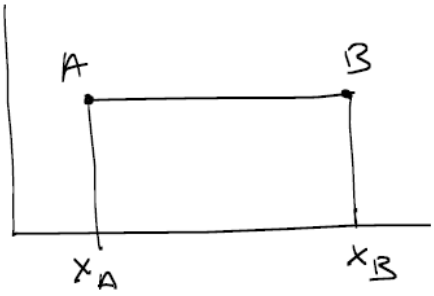
Integral

Area under the curve





Integral = Area of the trapezoid



Power Rule

$$\int_{x_A}^{x_B} x^n \, dx = \frac{1}{n+1} x^{n+1} \Big]_{x_A}^{x_B} = \frac{1}{n+1} x_B^{n+1} - \frac{1}{n+1} x_A^{n+1}$$

Constants

$$\int_1^2 x \, dx = \frac{1}{2} x^2 \Big]_1^2 = \frac{1}{2}(2)^2 - \frac{1}{2}(1)^2$$

$$\int_{x_A}^{x_B} e^{ax} \, dx = \frac{1}{a} e^{ax} \Big]_{x_A}^{x_B}$$

Special Case

$$\int_{x_A}^{x_B} x^{-1} \, dx = \ln(x) \Big]_{x_A}^{x_B} = \ln(x_B) - \ln(x_A)$$

$$\frac{dy}{dx}(\ln(x)) = \frac{1}{x}$$