

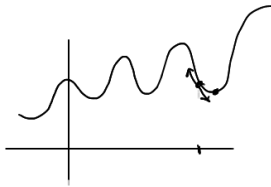
What is calculus

Derivative: instantaneous rate of change

study of
change
using
limits

$$\lim_{x_1 \rightarrow x_2} \frac{y_1 - y_2}{x_1 - x_2}$$

slope = $\frac{\Delta y}{\Delta x} = \frac{y_1 - y_2}{x_1 - x_2}$
(depends on 2 pieces of information)



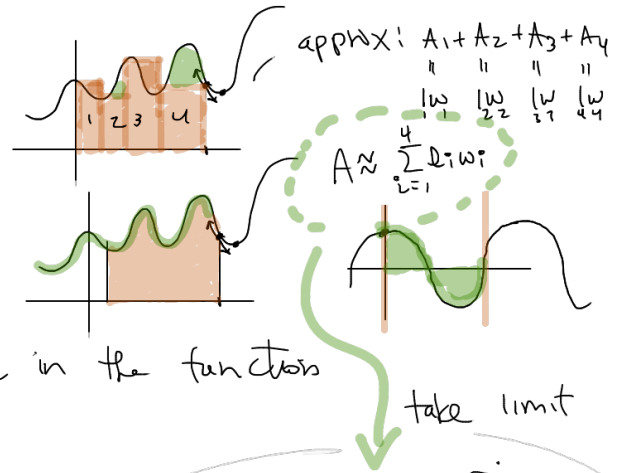
Integrals: give an area under curve

(you integrate a function with its domain)

(this produces the total (net) change in the function)

(accumulation)

study of accumulation
using limits



approx: $A_1 + A_2 + A_3 + A_4$
 $\Delta w_1 \quad \Delta w_2 \quad \Delta w_3 \quad \Delta w_4$

$$A \approx \sum_{i=1}^4 \Delta w_i$$

take limit

$$\lim_{N \rightarrow \infty} \sum_{i=1}^N \Delta w_i = \int \Delta w$$

Recall: Integration Technique: u-sub

$$\textcircled{1} \frac{d}{dx} (5x^3) = 3 \cdot 5x^2 = 15x^2$$

↑
power rule

$$\left(\frac{d}{dx} (C) = 0 \right)$$

all functions whose derivative = $15x^2$

$$\textcircled{2} \int 15x^2 dx = 15x^{\frac{3}{3}} + C = 5x^3 + C$$

↑
x = variable
power rule

$$\textcircled{3} \int 15(3x+1)^2 dx \leftrightarrow \int 15u^2 du$$

match