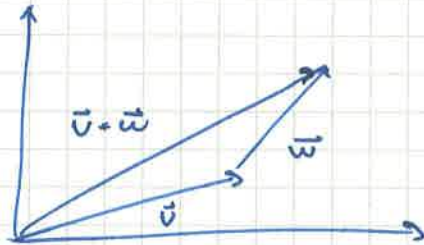


Vectors

$$\vec{v} = (v_x, v_y, v_z)$$

$$|\vec{v}| = \sqrt{v_x^2 + v_y^2 + v_z^2}$$

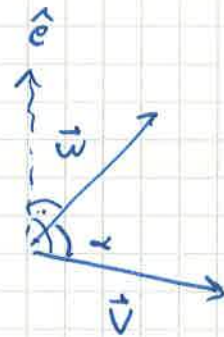
$$\vec{v} + \vec{w} = (v_x + w_x, v_y + w_y, v_z + w_z)$$



$$a\vec{v} = (av_x, av_y, av_z)$$

$$\vec{v} \cdot \vec{w} = |\vec{v}| |\vec{w}| \cos \alpha = x$$

$$\vec{v} \times \vec{w} = |\vec{v}| |\vec{w}| \sin \alpha \hat{e} = \vec{x}$$



Geometry

Area



$$a^2$$



$$ab$$

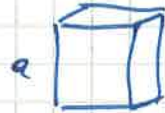


$$\frac{bh}{2}$$

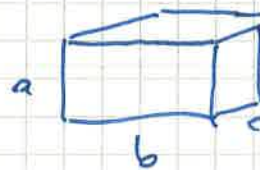


$$\pi r^2$$

Volume



$$a^3$$



$$abc$$

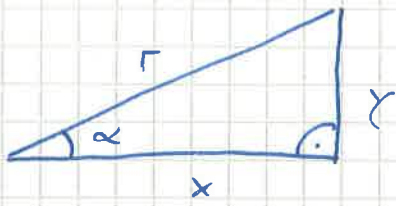


$$\frac{abh}{3}$$



$$\frac{4}{3} \pi r^3$$

Trigonometry



$$\sin \alpha = \frac{y}{r}$$

$$\cos \alpha = \frac{x}{r}$$

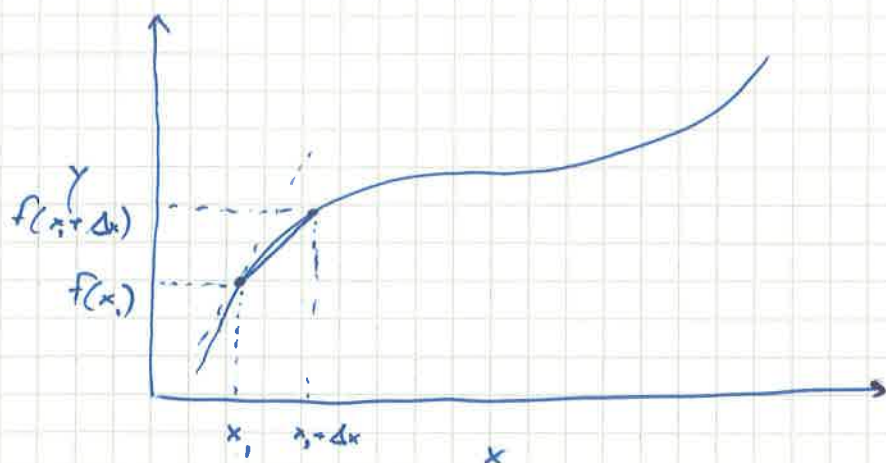
$$\tan \alpha = \frac{y}{x} = \frac{\sin \alpha}{\cos \alpha}$$

$$x^2 + y^2 = r^2$$

$$\frac{x^2}{r^2} + \frac{y^2}{r^2} = \frac{r^2}{r^2}$$

$$\cos^2 \alpha + \sin^2 \alpha = 1$$

Derivatives



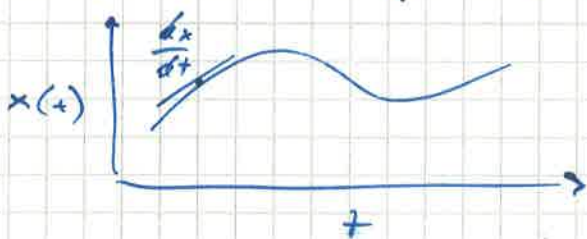
$$y = f(x)$$

$$\frac{\Delta y}{\Delta x} = \frac{f(x_1 + \Delta x) - f(x_1)}{\Delta x}$$

$$y' = \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} = \frac{dy}{dx}$$

$$y' = \frac{dy}{dx}$$

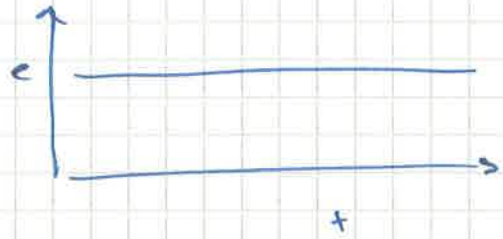
$$y'' = \frac{d}{dx} \left(\frac{dy}{dx} \right) = \frac{d^2 y}{dx^2}$$



$$\text{velocity} \rightarrow \frac{dx}{dt} = \dot{x}$$

$$\text{acceleration} \rightarrow \frac{d^2 x}{dt^2} = \ddot{x}$$

$$\frac{dC}{dt} = 0 \quad \leftarrow \text{constant}$$



$$\frac{d}{dt} (C \cdot f(t)) = C \cdot \frac{df(t)}{dt}$$

$$\frac{d}{dt} (f(t) + g(t)) = \frac{df(t)}{dt} + \frac{dg(t)}{dt}$$

$$\frac{d}{dt} f(x(t)) = \frac{df}{dx} \cdot \frac{dx}{dt}$$

$$\frac{d}{dt} (f(t) \cdot g(t)) = \frac{df(t)}{dt} \cdot g(t) + f(t) \cdot \frac{dg(t)}{dt}$$

$$\frac{d\vec{v}}{dt} = \vec{\dot{v}} = \left(\frac{dv_x}{dt}, \frac{dv_y}{dt}, \frac{dv_z}{dt} \right)$$

$$\vec{v} = (v_x, v_y, v_z)$$

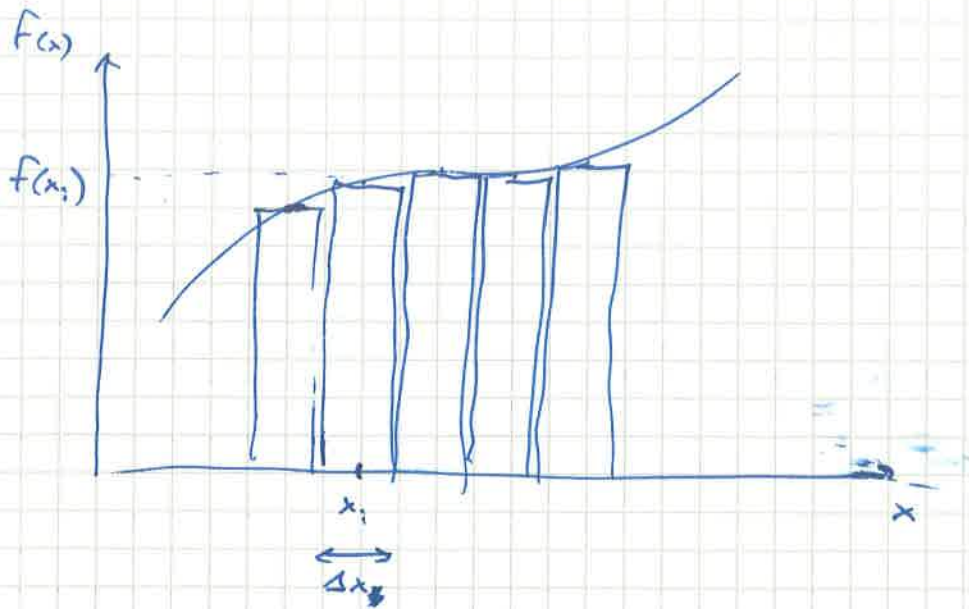
$$\frac{d(t^n)}{dt} = n t^{n-1}$$

$$\frac{d}{dt} \sin(\omega t) = \omega \cos(\omega t)$$

$$\frac{d}{dt} e^{at} = a e^{at}$$

⋮

Integrals



$$\Delta \text{Area} = \lim_{\Delta x_i \rightarrow 0} \sum_i f(x_i) \Delta x_i = \int f(x) dx$$

$$g(x) = \int f(x) dx = \lim_{\Delta x_i \rightarrow 0} \sum_i f(x_i) \Delta x_i$$

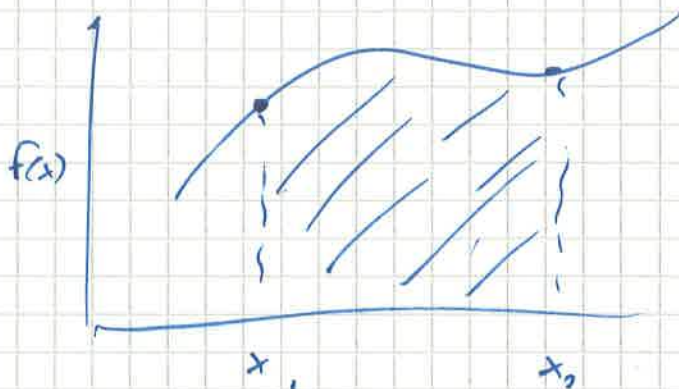
$$g(x) = \sum_i \underbrace{\left(\lim_{\Delta x_i \rightarrow 0} f(x_i) \Delta x_i \right)}_{\Delta g}$$

$$\Delta g = \lim_{\Delta x \rightarrow 0} f(x_i) \Delta x = f(x) \lim_{\Delta x \rightarrow 0} \Delta x$$

$$f(x) = \frac{\lim_{\Delta x \rightarrow 0} \Delta g}{\Delta x} = \frac{dg(x)}{dx}$$

$$f(x) = \frac{dg(x)}{dx} \iff g(x) = \int f(x) dx$$

$$\int_{x_1}^{x_2} f(x) dx = g(x_2) - g(x_1)$$



$$\int C dt = At$$

$$\int At^n dt = A \frac{t^{n+1}}{n+1}, \quad n \neq -1$$

$$\int e^{at} dt = \frac{1}{a} e^{at}$$

$$\int \cos(\omega t) dt = \frac{1}{\omega} \sin(\omega t)$$