

- **Differentiation** of trig functions:

$$\frac{d}{dx} (\sin x) = \cos x$$

$$\frac{d}{dx} (\cos x) = -\sin x$$

$$\frac{d}{dx} (\tan x) = \sec^2 x$$

$$\frac{d}{dx} (\cot x) = -\operatorname{cosec}^2 x$$

- **Integration** of trig functions

$$\int \cos x \, dx = \sin x + c$$

$$\int \sin x \, dx = -\cos x + c$$

$$\int \sec^2 x \, dx = \tan x + c$$

$$\int \operatorname{cosec}^2 x \, dx = -\cot x + c$$

- **Function of a function:** if $y = f(x)$ and $x = g(t)$, then

$$\frac{dy}{dt} = \frac{dy}{dx} \frac{dx}{dt}$$

- **Integration by substitution:** if $y = \int f(x) dx$ and $x = g(u)$, then

$$y = \int f(g(u)) \frac{du}{dx} dx$$

- **Integration by parts:** if u and v are functions of x , then

$$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$$

- A **first order differential equation** is of the form

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

where f is a function of x and y .