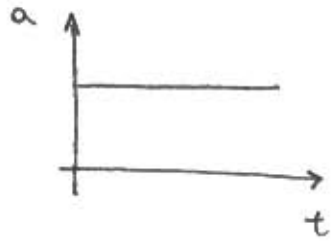
Kinematic Equations for Constant Acceleration

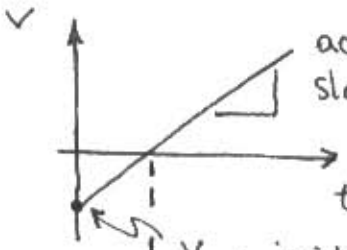


$$a = \text{constant} = \frac{dv}{dt}$$

$$\rightarrow \quad dv = a\,dt$$

$$\int dv = a\int dt$$

$$v = at + C \quad \leftarrow \text{integration constant}$$



acceleration is slope (constant)

$$\boxed{v = v_0 + at}$$

v_0 - initial velocity is y-intercept

equation of straight line

$y = mx + b$

we also know that

$$v = \frac{dx}{dt} \quad \text{in general}$$

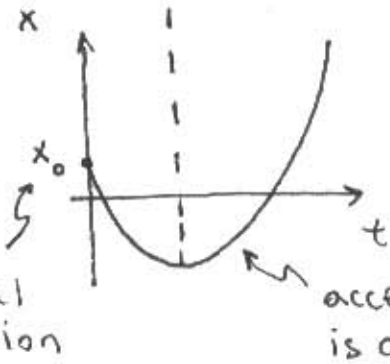
$$\rightarrow \quad dx = v\,dt$$

$$\int dx = \int v\,dt$$

$$= \int (v_0 + at)\,dt$$

$$= v_0\int dt + a\int t\,dt$$

$$x = v_0 t + \frac{1}{2}at^2 + C$$



initial position

acceleration is curvature (constant)

$$\boxed{x = x_0 + v_0 t + \frac{1}{2}at^2}$$

equation of parabola, constant curvature

eliminate variable t in boxed equations

$$\rightarrow \quad \boxed{v^2 = v_0^2 + 2a(x - x_0)}$$