

## Al. Sandia Virtual Academy

### Third Eq<sup>n</sup> of Motion:

acceleration =  $a$ , where  $a$  is constant

$$a = \frac{dv}{dt} = \frac{dx}{dt} \cdot \frac{dv}{dx} \quad v \frac{dv}{dx} = a$$

$$v dv = a dx$$

$$\int v dv = a \int dx$$

$$\frac{v^2}{2} = ax + E \rightarrow (5)$$

where  $E$  is constant of integration

Initial Cond at  $t=0$ ,  $x=0$  and  $v=u$

$$(5) \Rightarrow \frac{u^2}{2} = a(0) + E$$

$$E = \frac{u^2}{2}$$

Putting the value of  $E$  in eq (5)

$$(5) \Rightarrow \frac{v^2}{2} = ax + \frac{u^2}{2}$$

$$v^2 = 2ax + u^2$$

$$\boxed{2ax = v^2 - u^2} \rightarrow (6)$$

This is the third Eq<sup>n</sup> of Motion.

### Variable Acceleration

Variable acceleration is that which is not uniform. It may be a function of time, velocity or distance.

(i) Time dependent Acc:

Time dependent acc is function of time only. In case of time dependent acc, we have

$$\frac{d^2x}{dt^2} = a(t)$$

$$d \left( \frac{dx}{dt} \right) = a(t)$$