

Motion with Variable Acceleration.

(i) If acceleration is a function of time

$$a = f(t) \quad \text{Then } v = u + \int_0^t f(t) dt \text{ and } s = ut + \int \left(\int f(t) dt \right) dt$$

(ii) If acceleration is a function of distance

$$a = f(x) \quad \text{Then } v^2 = u^2 + 2 \int_{x_0}^x f(x) dx$$

(iii) If acceleration is a function of velocity

$$a = f(v) \quad \text{Then } t = \int_u^v \frac{dv}{f(v)} \text{ and } x = x_0 + \int_u^v \frac{v dv}{f(v)}$$