$$\frac{x - x_0}{t} = v_{0x} + \frac{1}{2}a_x t$$

$$\Rightarrow x - x_0 = t\left(v_{0x} + \frac{1}{2}a_x t\right)$$

$$\boxed{x - x_0 = v_{0x}t + \tfrac{1}{2}a_x t^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (1.4)}$$ **Working formula**

Derivation of 3rd kinematic equation:

To relate displacement, acceleration, initial velocity and final velocity, we should find the time from equation (1.1) as

$$t = \frac{v_x - v_{0x}}{a_x} \ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (1.5)$$

Substituting above value of time't' in eq.(1.4), we get

$$x - x_0 = v_{0x}t + \frac{1}{2}a_x t^2$$

$$\Rightarrow x - x_0 = v_{0x}\left(\frac{v_x - v_{0x}}{a_x}\right) + \frac{1}{2}a_x\left(\frac{v_x - v_{0x}}{a_x}\right)^2$$

$$\Rightarrow x - x_0 = \frac{v_{0x}v_x}{a_x} - \frac{{v_{0x}}^2}{a_x} + \frac{1}{2}a_x\left(\frac{{v_x}^2 + {v_{0x}}^2 - 2v_{0x}v_x}{{a_x}^2}\right)$$

$$\Rightarrow x - x_0 = \frac{2v_{0x}v_x - 2{v_{0x}}^2 + {v_x}^2 + {v_{0x}}^2 - 2v_{0x}v_x}{2a_x}$$

$$\Rightarrow 2a_x(x - x_0) = {v_x}^2 - {v_{0x}}^2$$

$$\boxed{{v_x}^2 = {v_{0x}}^2 + 2a_x(x - x_0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.6)}$$ **Working formula**

The above eq.(1.1),(1.4) and (1.6) can be resolved in to three sets of equations to describe the motion along the three Cartesian directions as

$$v_x = v_{0x} + a_x t; \qquad v_y = v_{0y} + a_y t; \qquad v_z = v_{0z} + a_z t;$$

$$(x - x_0) = v_{0x}t + \frac{1}{2}a_x t^2; \qquad (y - y_0) = v_{0y}t + \frac{1}{2}a_y t^2; \qquad (z - z_0) = v_{0z}t + \frac{1}{2}a_z t^2;$$

$${v_x}^2 = {v_{0x}}^2 + 2a_x(x - x_0); \qquad {v_y}^2 = {v_{0y}}^2 + 2a_y(y - y_0); \qquad {v_z}^2 = {v_{0z}}^2 + 2a_z(z - z_0);$$

Best of luck