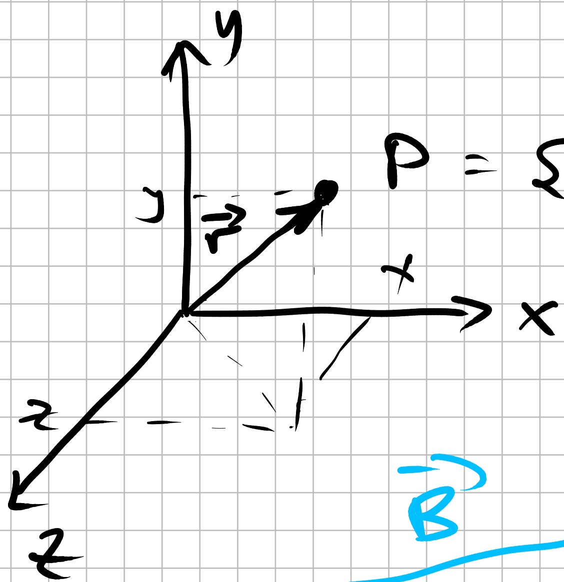
$$x(t) = x_0 + v_0 t + \frac{at^2}{2}$$

$$\frac{dx(t)}{dt} = \frac{dx_0}{dt} + \frac{d(v_0 t)}{dt} + \frac{d\left(\frac{at^2}{2}\right)}{dt} =$$

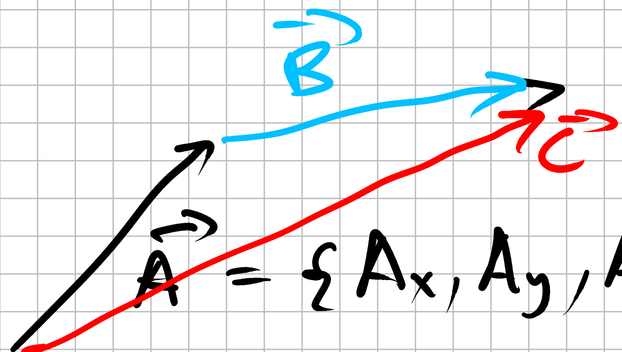
$$= 0 + v_0 + \frac{2at}{2}$$

$$v(t) = v_0 + at$$



$$P = \{x, y, z\}$$

$$\vec r = \{x, y, z\}$$



$$\vec A = \{A_x, A_y, A_z\}$$

$$\vec C = \vec A \pm \vec B$$

$$\{C_x, C_y, C_z\} =$$

$$= \{A_x \pm B_x, A_y \pm B_y, A_z \pm B_z\}$$

$$\vec A \cdot \vec B = A_x \cdot B_x + A_y \cdot B_y + A_z \cdot B_z$$

$$|\vec A|^2 = \vec A \cdot \vec A = A_x \cdot A_x + A_y \cdot A_y + A_z \cdot A_z$$

↑ (length of the vector)^2

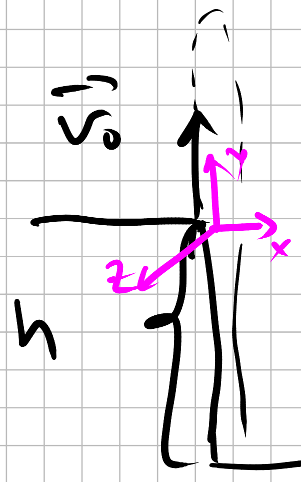
$$\vec{r} = \vec{r}_0 + \vec{v}t + \frac{\vec{a}t^2}{2}$$

$$\begin{cases} x = x_0 + v_{x_0}t + \dfrac{a_x t^2}{2} \\ y = y_0 + v_{y_0}t + \dfrac{a_y t^2}{2} \\ z = z_0 + v_{z_0}t + \dfrac{a_z t^2}{2} \end{cases} \iff \vec{a} \text{ is a constant in time}$$

$$x_f = x_0 + \frac{v_{fx}^2 - v_{0x}^2}{2a_x}$$

$$y_f = y_0 + \frac{v_{fy}^2 - v_{0y}^2}{2a_y}$$

z same idea



$$\vec{r}(t) = \vec{r}_0 + \vec{v}_0 t + \frac{\vec{a}\, t^2}{2}$$

$$\downarrow \vec{a} = \{0, -g, 0\}$$

$$g = 9{,}8\ \frac{m}{s^2}$$

$$z(t) = 0 + 0t + \frac{0 \cdot t^2}{2} = 0$$

$$x(t) = 0$$

$$y(t) = 0 + v_{0y} \cdot t + \frac{a_y t^2}{2} =$$

$$-h = 0 + v_{0y} t + \frac{-g t^2}{2}$$

$$-\frac{g t^2}{2} + v_{0y} t + h = 0$$

$$A t^2 + B t + C = 0$$

$$t = \frac{-B \pm \sqrt{B^2 - 4 \cdot A \cdot C}}{2A}$$

$$t = \frac{-v_{0_y} \pm \sqrt{v_{0_y}^2 - 4\left(-\frac{g}{2}\right)\cdot h}}{2\cdot\left(-g/2\right)}$$

$v_{0_y} = 4\ m/s$

$h = 1\ m$

$g = 9.8\ \frac{m}{s^2} \approx 10\ \frac{m}{s^2}$

$$t = \frac{-4 \pm \sqrt{16 - 4\,\frac{-10}{2}\cdot 1}}{-10}$$

$$= \frac{-4 \pm \overbrace{\sqrt{36}}^{=6}}{-10} =$$

$$= \frac{-4 \pm 6}{-10} = \boxed{1s}\ ;\ -0.2s$$