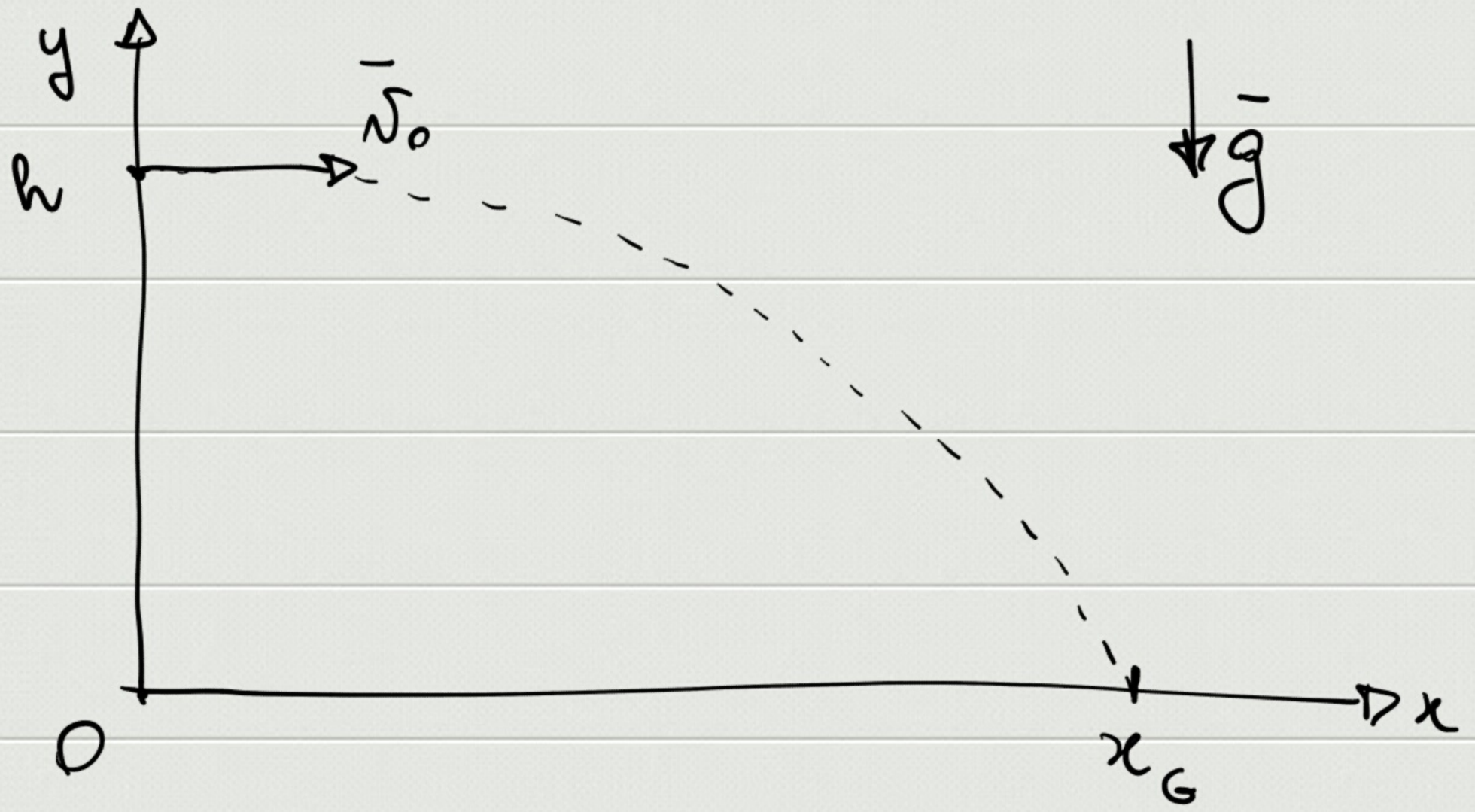


$v_{0x} = v_0 \qquad v_{0y} = 0 \qquad (t_0 = 0)$

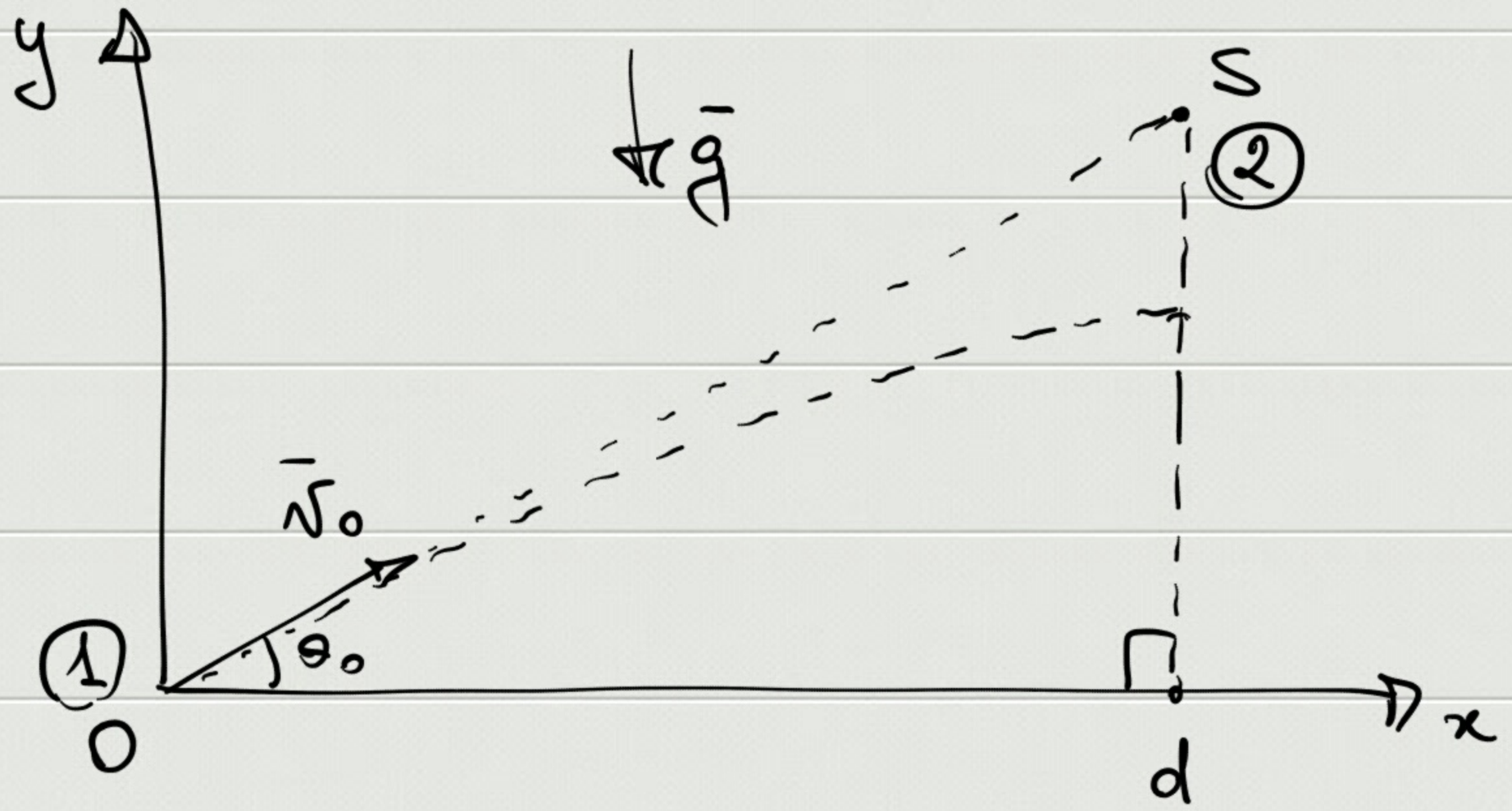
$x_0 = 0 \qquad y_0 = h$

$$\begin{cases} v_x(t) = v_0 \\ v_y(t) = -gt \end{cases} \qquad \begin{cases} x(t) = v_0 t \\ y(t) = h - \frac{1}{2} g t^2 \end{cases}$$

$$y(t_G) = 0 \Rightarrow \boxed{t_G = \sqrt{\frac{2h}{g}}} \Rightarrow \boxed{x_G = v_0 \sqrt{\frac{2h}{g}}}$$

$$v(t_G) = \sqrt{v_x^2(t_G) + v_y^2(t_G)} =$$

$$= \sqrt{v_0^2 + 2gh}$$



$$1: \begin{cases} x_1(t) = v_0 \cos\theta_0 \cdot t \\ y_1(t) = v_0 \sin\theta_0\, t - \frac{1}{2} g t^2 \end{cases}$$

$$2: \begin{cases} x_2(t) = d \\ y_2(t) = d\, tg\,\theta_0 - \frac{1}{2} g t^2 \end{cases}$$

$$x_1(t^*) = d = v_0 \cos\theta_0 \cdot t^* \Rightarrow t^* = \frac{d}{v_0 \cos\theta_0}$$

$$y_1(t^*) = \cancel{v_0} \sin\theta_0 \cdot \frac{d}{\cancel{v_0}\cos\theta_0} - \frac{1}{2} g \frac{d^2}{v_0^2 \cos^2\theta_0} =$$

$$= d\, tg\,\theta_0 - \frac{g d^2}{2 v_0^2 \cos^2\theta_0}$$

$$y_2(t^*) = d\, tg\,\theta_0 - \frac{1}{2} g \frac{d^2}{v_0^2 \cos^2\theta_0}$$

$$y_1(t^*) = y_2(t^*)$$