

$$\bar{v} = (v_0 * \cos(\alpha); v_0 * \sin(\alpha) - g * t)$$

$$\bar{r} = \left(v_0 * \cos(\alpha) * t; v_0 * \sin(\alpha) * t - \frac{g * t^2}{2} \right)$$

$$(\bar{v} * \bar{r}) = 0$$

$$v_0 * \cos(\alpha) * v_0 * \cos(\alpha) * t + (v_0 * \sin(\alpha) - g * t) * \left(v_0 * \sin(\alpha) * t - \frac{g * t^2}{2} \right) = 0$$

$$\left(v_0 * \cos(\alpha) * v_0 * \cos(\alpha) + (v_0 * \sin(\alpha) - g * t) * \left(v_0 * \sin(\alpha) - \frac{g * t}{2} \right) \right) * t = 0$$

$$v_0^2 * \cos^2(\alpha) + (v_0 * \sin(\alpha) - g * t) * \left(v_0 * \sin(\alpha) - \frac{g * t}{2} \right) = 0$$

$$\frac{g^2}{2} * t^2 - \frac{3 * g * v_0 * \sin(\alpha)}{2} t + v_0^2 = 0$$

$$t^2 - 3 * \left(\frac{v_0}{g} \right) * \sin(\alpha) * t + 2 * \left(\frac{v_0}{g} \right)^2 = 0$$

$$D = \left(3 * \left(\frac{v_0}{g} \right) * \sin(\alpha) \right)^2 - 4 * 2 * \left(\frac{v_0}{g} \right)^2$$

$$D = 0$$

$$\left(3 * \left(\frac{v_0}{g} \right) * \sin(\alpha) \right)^2 - 4 * 2 * \left(\frac{v_0}{g} \right)^2 = 0$$

$$9 * \sin^2(\alpha) - 8 = 0$$

$$|\sin(\alpha)| = \frac{2\sqrt{2}}{3}$$

$$t = \frac{3}{2} * \left(\frac{v_0}{g} \right) * \sin(\alpha)$$

$$t > 0 \Rightarrow \sin(\alpha) > 0 \Rightarrow \sin(\alpha) = \frac{2\sqrt{2}}{3}$$