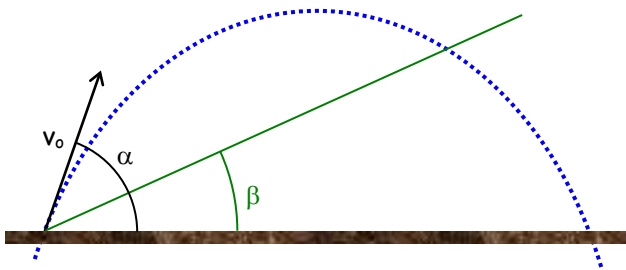HOMEWORK SET 2: PROJECTILES
Due Monday, September 5, 2022

1) If a projectile is fired from the origin of the coordinate system with an initial velocity v_o and in a direction making an angle α with the horizontal, show that the time required for the projectile to cross a line passing through the origin and making an angle $\beta < \alpha$ with the horizontal is

$$t_o = \frac{2v_o}{g}(\sin\alpha - \cos\alpha\tan\beta)$$

2) A projectile is fired with a velocity v_o such that it passes through two points both a distance h above the horizontal. Show that if the gun is adjusted for maximum range (derive what the angle is!), the separation of the points is

$$d = \frac{v_o}{g}\sqrt{v_o^2 - 4gh}$$
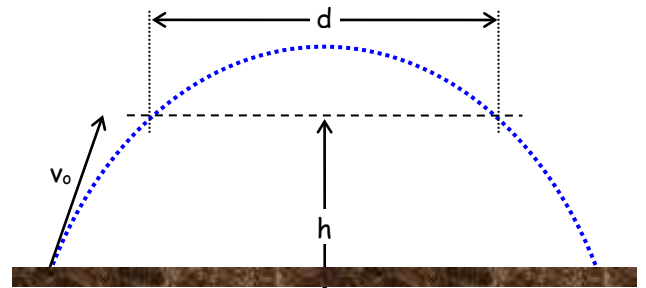
3) Two balls are thrown with equal speeds from the top of a cliff of height h. One is thrown at an angle α above the horizontal. The other is thrown at an angle β below the horizontal. Show that each strikes the ground with the same speed and find the speed in terms of h and the intial speed v_0.

Remember, final speed is total speed, $v = \sqrt{v_x^2 + v_y^2}$, not just v_y!