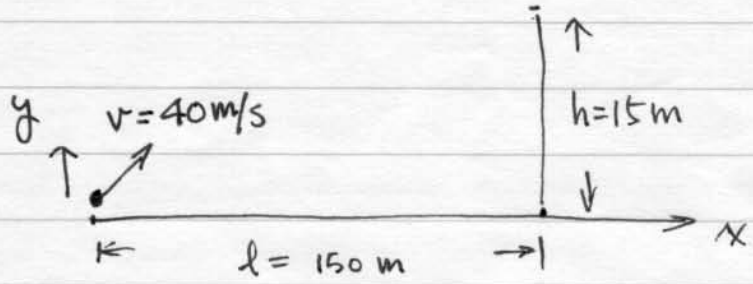
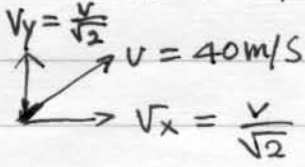
Homework #4

1. (a)



(a) If the cannonball is fired at a 45° degree angle.



$$\begin{cases} \text{in the x direction,} & x = v_x t \\ \text{in the y direction,} & y = v_y t - \frac{1}{2} g t^2 \end{cases} \Rightarrow y = x - \frac{1}{2} g \left(\frac{x}{v_x}\right)^2 = x - \frac{g x^2}{2 v_x^2}$$

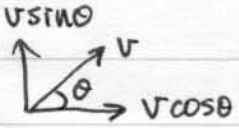
$$y = x - \frac{g x^2}{v^2}$$

so. when $x = 150m$

$$y \doteq 12.2m < h = 15m$$

It can not make the cannonball over the wall.

(b) If the cannonball is fired at a θ angle



in the x direction. $x = v\cos\theta t$

in the y direction. $y = v\sin\theta t - \frac{1}{2} g t^2 = v\sin\theta \frac{x}{v\cos\theta} - \frac{1}{2} g \frac{x^2}{v^2\cos^2\theta}$

$$= x\tan\theta - \frac{g x^2}{2 v^2 \cos^2\theta}$$

if we want the ball over the wall. $y \geq 15m$ (when $x = 150m$)

$h_{max} \doteq 12.[redacted]\,m$

So it's impossible to make the ball over the wall.