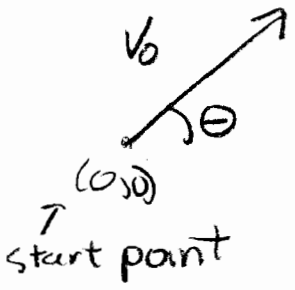
Notes For HW #6

12)



$\vec{a} = \langle 0, -9.8 \rangle$

$\vec{v} = \langle C_1, -9.8t + C_2 \rangle$

(i.e. integrate a)

$\vec{v}(0) = \langle V_0 \cos\theta, V_0 \sin\theta \rangle$

(initial condition)

$\Rightarrow \vec{v} = \langle V_0 \cos\theta, V_0 \sin\theta - 9.8t \rangle$

$\Rightarrow \vec{r} = \langle (V_0 \cos\theta)t + C_1, (V_0 \sin\theta)t - 4.9t^2 + C_2 \rangle$

(i.e. integrate v)

$\Rightarrow \vec{r}(0) = \langle C_1, C_2 \rangle = (0,0)$

$\Rightarrow \vec{r}(t) = \langle (V_0 \cos\theta)t, V_0 \sin(\theta)t - 4.9t^2 \rangle$

$\Rightarrow$ projectile hits ground when $y = 0$

$\Rightarrow V_0 \sin(\theta)t - 4.9t^2 = 0 \Rightarrow t(V_0 \sin(\theta) - 4.9t) = 0$

$\Rightarrow t = 0$ (start) $\quad t = \frac{V_0 \sin\theta}{4.9}$ (end)

$\therefore$ range $= x\left(\frac{V_0 \sin\theta}{4.9}\right) = \boxed{\frac{V_0^2 \cos(\theta)\sin\theta}{4.9} = \text{range}}$

13) Use equation From (12)

$y = 0$ when $\boxed{t = \frac{V_0 \sin\theta}{4.9}}$