Ch4 p.106 #12

12)

My thinking starts here, which ended up being part (b)!

b) at $t=1$, $\vec{v} = (2.0\hat{i} + 2.0\hat{j})$ ms

at $t=2$, it is at the max height. Since v_x is constant, the velocity at that time is $\xrightarrow[2.0 m/s]{}$, with no v_{fy} since $v_{fy}=0$ at the max ht.

So... the vertical direction has a change in velocity from $\uparrow$ to 0 in 1 second. We can find acceleration from this:

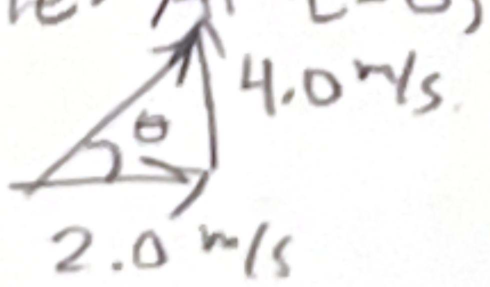
$v_{fy} = v_{iy} + a\Delta t$ for the Δt from $t=1s$ to $t=2s$

$0 = 2 m/s + a(1s)$

$-2 m/s^2 = a$

Since $a_y = -g$ for free fall and projectile motion, $\boxed{g = 2 m/s^2}$

c) Launch angle: At $t=0$, the velocity was

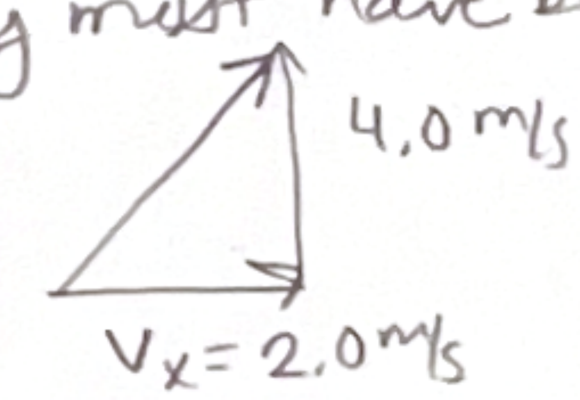


$\tan\theta = \frac{4.0 m/s}{2.0 m/s}$

$\boxed{\theta = 63° \text{ above } +x\text{-axis}}$

a) We know v_x is the same at all these times. We can see that from $t=1s$ to $t=2s$, the v_{fy} changed by $-2 m/s$. Since this is due to the acceleration of gravity on a planet, the acceleration should be the same every second, and the vertical velocity will change by $-2 m/s$ every second.

Therefore, at $t=0$ the components of velocity must have been:

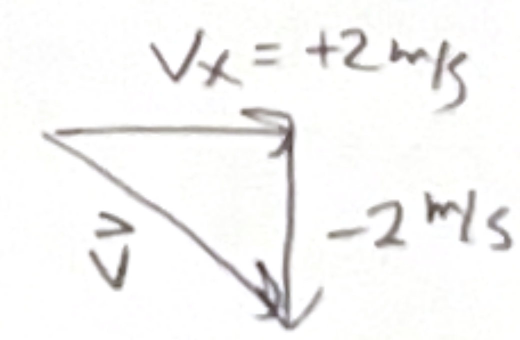


$\boxed{\vec{v} = (2.0\hat{i} + 4.0\hat{j}) m/s}$

At $t=2s$, v_y is zero, so the velocity is v_x only.

$\boxed{\vec{v} = (2.0\hat{i}) m/s}$

At $t=3s$, v_y must change from its value the previous second by $-2 m/s$, so its new value is $-2 m/s$.



$\boxed{\vec{v} = (2.0\hat{i} - 2.0\hat{j}) m/s}$