UNIT 4 KEY

SP4-1)

a) $x = \int_0^{2.5} v(t)\,dt$

$= \frac{1}{2}(1s)(2\,m/s) + \frac{1}{2}(1.5s)(-1\,m/s)$

$= \frac{1}{2}(2m - 1.5m) = 0.25\,m.$ ← 2pts.

b) want t where $\int_0^t v(t)\,dt = 0$

$\underbrace{\frac{1}{2}(1s)(2m/s)}_{1^{st}\text{ triangle}} + \underbrace{\frac{1}{2}\left(\frac{-1\,m/s}{1.5s}\right)(t-1)^2}_{2^{nd}\text{ triangle}} = 0.$

($\frac{-1\,m/s}{1.5s}$ ← slope)

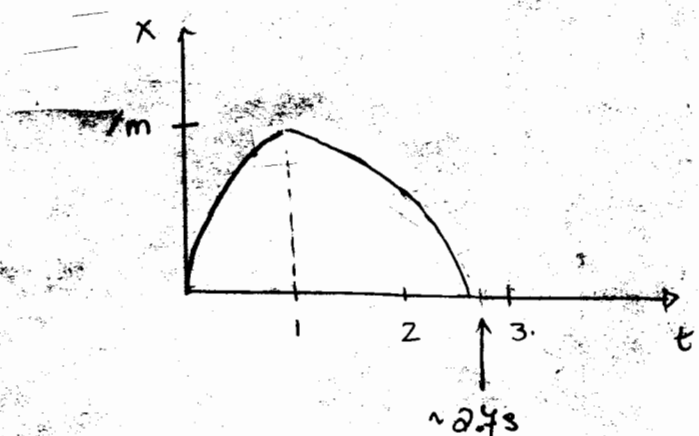
$\frac{1}{1.5}(t-1)^2\,m/s^2 = 2\,m.$

$(t-1)^2 = 3s^2$

$t - 1 = 3s$

$t = 1 + \sqrt{3}\,s = 2.7s$ ← 2pts.

c) from $\Delta x = v_0\Delta t + \frac{a(\Delta t)^2}{2}$ → parabolic curves



← 2pts

-1 pts if not parabolic

-.5 pts. scales not labeled.

SP4-2)

a) $\Delta x = v_0 t + \frac{1}{2} a t^2$

$t(\frac{1}{2}at + v_0) = 0$

$t = \not{0}\ ,\ -\frac{2v_0}{a}$

$t = -\frac{2v_0}{a} = \frac{-2(10\ m/s)}{-9.8\ m/s^2} = 2.04s$ ← 2pts.

b) Time to reach top:

$\Delta v = at$

$t = \frac{\Delta v}{a} = \frac{0 - 10\ m/s}{-9.9\ m/s^2} = 1.01s$

distance travelled?

$x = \frac{1}{2}(v_0 + \not{v_f}^{0})t$

$= \frac{1}{2}(10\ m/s)(1.01s)$

$= 5.05\ m$

time of fall:

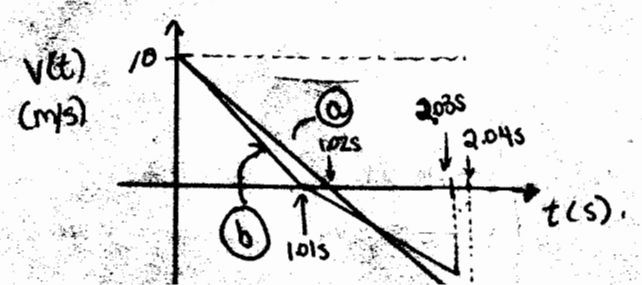
$x = x_0 + \not{v_0 t}^{0} + \frac{1}{2}at^2$

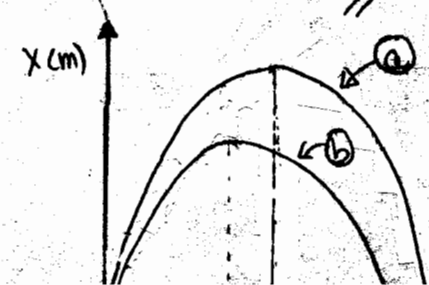
$\Delta x = \frac{1}{2}at^2$

$t = \sqrt{\frac{2\Delta x}{a}} = \sqrt{\frac{2(0 - 5.05\ m)}{-9.7\ m/s^2}}$

$= 1.02s$ ← 2pts.

total time = $(1.01 + 1.02)s = 2.03s$





Note in b), v_f at $x = 0$ is not $-10\ m/s$