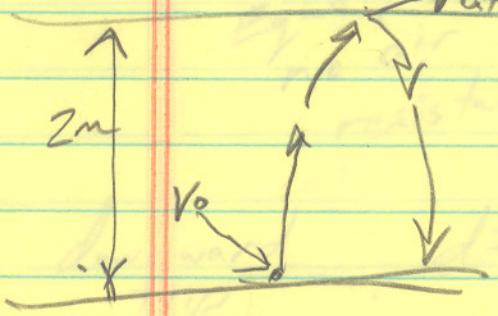
P. 1

A. Easiest Method.

Use this kinematics formula ⇒ $V^2 = V_0^2 + 2a(d)$

(Current Velocity, displacement, accel, Initial Velocity)

Apply the formula to the trip upward to the apogee

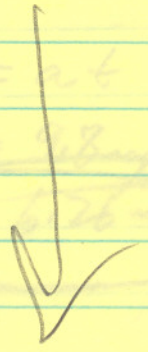


$0 = V_0^2 + 2(-9.8\,m/s^2)(2m)$

$39.2\,\frac{m^2}{s^2} = V_0^2$

$V_0 = 6.26\,m/s$

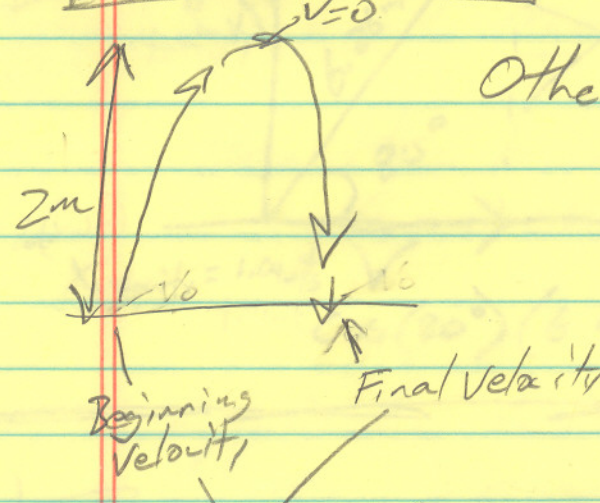
Other method



5.14 m/s

1.9 m

A, Continued



Other method: consider downward trip and use $(d = V_0 t + \frac{1}{2} a t^2)$ to get t, Then use $V = at$ to get the final velocity, which should be the same as the initial

V at apogee = 0 m/s

downward trip

$$d = V_0 t + \frac{1}{2} g t^2$$

$$-2m = 0 + \frac{1}{2}(-9.8 m/s^2) t^2$$

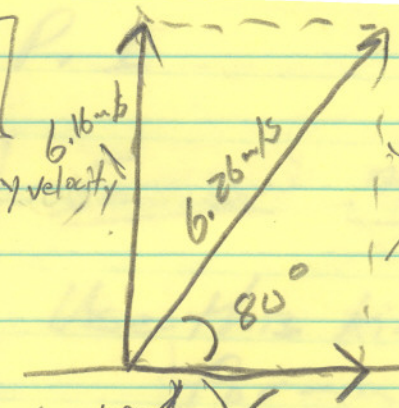
$$t = 0.64 s$$

$$V = at$$

$$V = 9.8 m/s^2 (0.64 s)$$

$$V = 6.26 m/s$$

B.



$\sin(80°)(6.26\ m/s) = 6.16\ m/s$ vertically

$\cos(80°)(6.26\ m/s) = 1.09\ m/s$ horizontally

$= V^2 + 2a(x - x_0)$

C. Time aloft = ?

$V = V_0 + at$

considering trip up → $0 = 6.16\ m/s + (-9.8\ m/s^2)(t)$ (V_0; V = 0 at top)

$t = \frac{6.16\ m/s}{9.8\ m/s^2} = 0.63\ s$ (time to top)

Time aloft = 2(time to top)

= 2(0.63 s)

= 1.26 s

$V = at$

$V = 0$, $V_0 = 6.16\ m/s$

or

Doubled ← Time to top

$2\left(\frac{V_0}{g}\right)$

Based on vertical

horiz. vel

dist = (rate)(time)

$d = (1.09\ m/s)(1.26\ s)$

$d = 1.37\ m$

2 ways to get time aloft

Calculating horizontal distance traveled.