

Extra Projectile Problems ("like" Test)

3 V2. a)

$v_{oy} = 0$
 $\Delta y = -3m$
 $a = -9.8m/s^2$
 $t = ?$

$\Delta y = v_{oy}t + \frac{1}{2}at^2$
 $-3m = 0 + \frac{1}{2}(-9.8m/s^2)t^2$

$t = 0.78s$

b) $\Delta x = 4m$
 $\Delta t = 0.78m$
 $a = 0$

$\Delta x = v_{ox}t + \frac{1}{2}at^2$

$4m = v_{ox}(0.78s)$

$v_{ox} = 5.11m/s$

3 V3.

a) $\Delta t = 2s$
 $v_{oy} = 0m/s$
 $\Delta y = ?$
 $a = -9.8m/s^2$

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

$\Delta y = -19.6m$

height = 19.6m

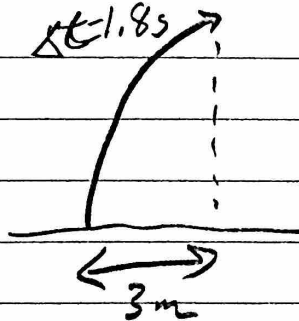
b) $\Delta x = 10m$
 $t = 2s$
 $a = 0$
 $v_{ox} = ?$

$10m = v_{ox}(2s)$

$v_{ox} = 5m/s$

5 V2.

$v_{yo} = ?$
 $a = -9.8m/s^2$
 $t = 1.8s$
 $v = 0$



a)

$v = v_{oy} + at$
 $0 = v_{oy} + (-9.8m/s^2)(1.8s)$
 $v_{oy} = 17.6m/s$

#5 V2, cont'd.

b) x dimension

$$V_{0x} = ?$$

$$a = 0$$

$$\Delta x = 3m$$

$$t = 1.8s$$

$$\Delta x = V_{0x} t + \frac{1}{2} a t^2$$

$$3m = V_{0x} (1.8s)$$

$$V_{0x} = 1.7m/s$$

c) y dimension

$$V_{0y} = 17.6m/s$$

$$t = 1.8s$$

$$\Delta y = ?$$

$$a = -9.8m/s^2$$

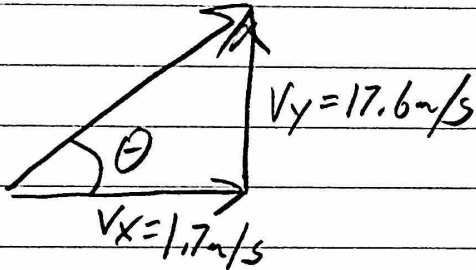
$$\Delta y = V_{0y} t + \frac{1}{2} a t^2$$

$$\Delta y = 17.6m/s(1.8s) + \frac{1}{2}(-9.8m/s^2)(1.8s)^2$$

$$\Delta y = 31.7m/s - 15.9m/s$$

$$\Delta y = 15.8m/s$$

d)



$$\tan \theta = \frac{17.6}{1.7}$$

$$\tan^{-1}\left(\frac{17.6}{1.7}\right) = \theta = 89^\circ$$

#5 V3.

a) y dimension

$$\Delta y = 10m$$

$$a = -9.8m/s^2$$

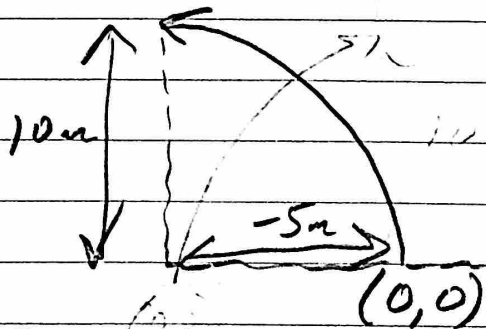
$$V_y = 0$$

$$V_{0y} = ?$$

$$V_y^2 = V_{0y}^2 + 2a\Delta y$$

$$0 = V_{0y}^2 + 2(-9.8m/s^2)(10m)$$

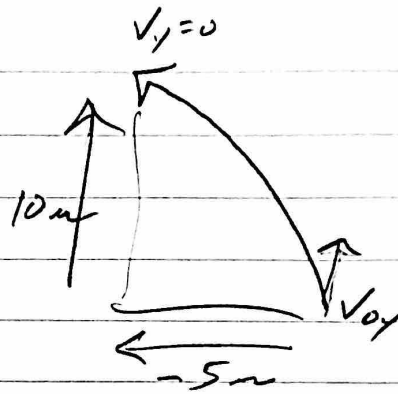
$$V_{0y} = 14m/s$$



#5V3, cont'd

b) y dimension

$$\begin{aligned}V_{oy} &= 14 \text{ m/s} \\V_y &= 0 \text{ m/s} \\a &= -9.8 \text{ m/s}^2 \\t &=?\end{aligned}$$

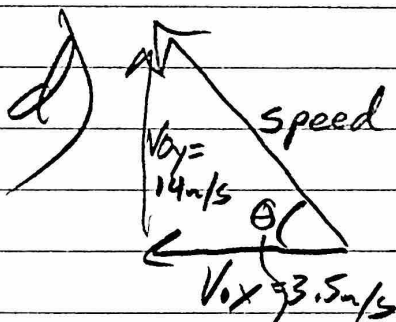


$$\begin{aligned}V_y &= V_{oy} + at \\0 &= 14 \text{ m/s} + (-9.8 \text{ m/s}^2)t \\t &= 1.42 \text{ s}\end{aligned}$$

c) x dimension

$$\begin{aligned}\Delta x &= -5 \text{ m} \\t &= 1.42 \text{ s} \\a &= 0 \text{ m/s}^2\end{aligned}$$

$$\begin{aligned}\Delta x &= V_{ox}t + \frac{1}{2}at^2 \\-5 \text{ m} &= V_{ox}(1.42 \text{ s}) \\V_{ox} &= 3.5 \text{ m/s}\end{aligned}$$



$$\begin{aligned}\text{Speed}_0 &= \sqrt{(14 \text{ m/s})^2 + (3.5 \text{ m/s})^2} \\&= 14.4 \text{ m/s}\end{aligned}$$

e) $\tan \theta = \frac{14}{3.5} \Rightarrow \tan^{-1}\left(\frac{14}{3.5}\right) = \theta = 76^\circ$