1. A. Yes $V_{iy} = 0$ ✓ constant negatie acceleration. ✓

B. Not. Should be constant

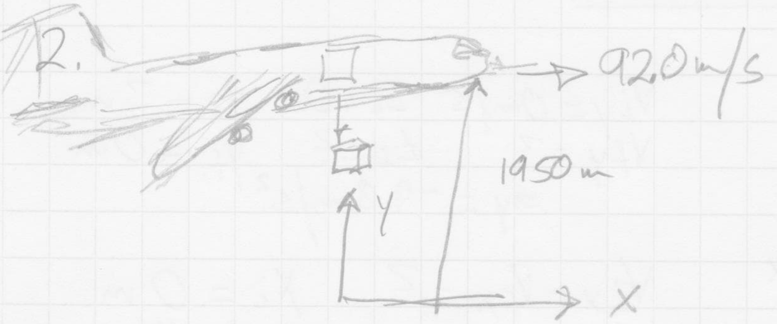
C. No. X-position should be increasing.

d. Nope. a_x needs to be zero.

e. Nah. Should be constant.

f. Yep. Looks like a parabola as it should.

2.



$V_{iy} = 0\,m/s$ $\quad y_i = 1950\,m$
$V_{fy} = ?$ $\quad y_f = 0\,m$
$a_y = -9.80\,m/s^2$

$t_i = 0\,s$ $\quad t_f = ?$
$x_i = 0\,m$ $\quad V_{ix} = V_{fx} = 92.0\,m/s$
$x_f = ?$

a)

$$\cancel{y_f}^{\,0} = y_i + \cancel{V_{iy}}^{\,0} \Delta t + \tfrac{1}{2} a_y \Delta t^2$$

$$\frac{-2y_i}{a_y} = \Delta t^2 = \frac{-2(1950\,m)}{-9.80\,m/s^2}$$

$$\Delta t = \sqrt{\frac{1950}{4.9}}\ s = 20.0\,s$$

$$\boxed{\Delta t = 20.0\,s}$$

b) $x_f = x_i + V_{ix} \Delta t$

$x_f = 0\,m + (92.0\,m/s)(20\,s)$

$$\boxed{x_f = 1840\,m}$$

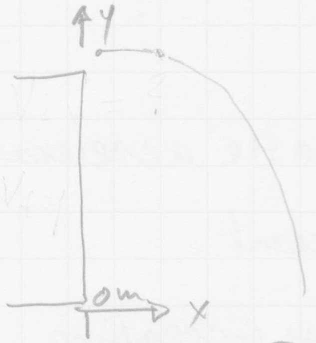
c. $V_{fy} = V_{iy} + a \Delta t$

$V_{fy} = 0\,m/s + (-9.8\,m/s^2)(20\,s)$

$$\boxed{V_{fy} = -196\,m/s}$$

$$\boxed{V_{fx} = 92.0\,m/s}$$

3.



$y_i = ?$ $t_i = 0s$ $V_{iy} = 0\,m/s$

$y_f = 0m$ $t_f = 7.56s$ $V_{if} = ?$

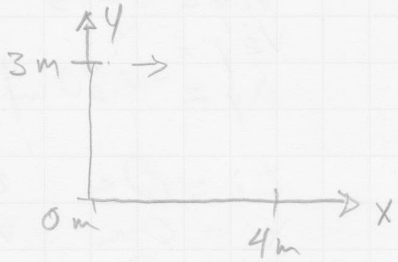
$a_y = -9.8\,m/s^2$

$$\cancel{y_f}^{\,0} = y_i + \cancel{V_{iy}}^{\,0}\Delta t + \tfrac{1}{2} a_y \Delta t^2$$

$$y_i = -\frac{a_y \Delta t^2}{2} = -\frac{(-9.8\,m/s^2)(7.56s)^2}{2}$$

$$\boxed{y_i = 280\,m}$$

4.



$V_{iy} = 0\,m/s$ $t_i = 0s$ $y_i = 3m$

$V_{fy} = ?$ $t_f = ?$ $y_f = 0m$

$a_y = -9.8\,m/s^2$

$V_{ix} = V_{fx} = ?$ $x_i = 0\,m$

$x_f = 4\,m$

a) $$y_f = y_i + \cancel{V_{iy}}^{\,0}\Delta t + \tfrac{1}{2} a_y \Delta t^2$$

$$\frac{2(y_f - y_i)}{a_y} = \Delta t^2$$

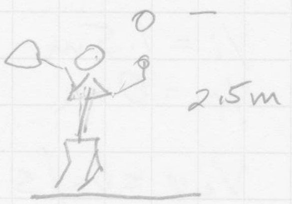
$$\Delta t = \left[\frac{2(0m - 3m)}{-9.8\,m/s^2}\right]^{1/2}$$

$$\Delta t = 0.78\,s$$

b) $$V_x = \frac{\Delta x}{\Delta t} = \frac{4m}{0.78s} =$$

$$\boxed{V_x = 5.1\,m/s}$$

p.251 5.



$v_{iy} = 0\,m/s \quad y_i = 2.5\,m \quad t_i = 0\,s$

$v_{fy} = ? \quad y_f = 0\,m \quad t_f = ?$

$a_y = -9.8\,m/s^2$

$$v_x = \frac{160\,km}{h}\left(\frac{1000\,m}{1\,km}\right)\left(\frac{1\,h}{3600\,s}\right) = 44.4\,m/s$$

a) Find t_f first.

$$\cancel{y_f} = y_i + \cancel{v_{iy}\Delta t} + \tfrac{1}{2} a_y \Delta t^2$$

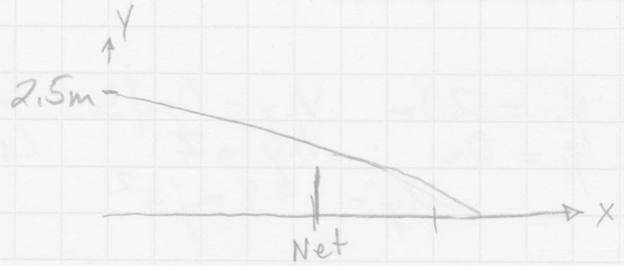
$$\Delta t^2 = \frac{-2y_i}{a_y}$$

$$\Delta t = \sqrt{\frac{-2y_i}{a_y}} = \sqrt{\frac{-2(2.5\,m)}{-9.8\,m/s^2}} \approx 0.71\,s$$

$$x_f = x_i + v_x \Delta t = 0\,m + (44.4\,m/s)(0.71\,s)$$

$$x_f = 31.7\,m$$

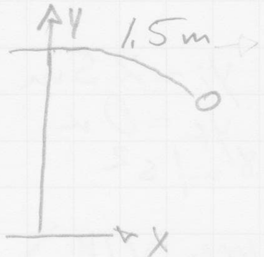
b)



The initial direction must be at an angle downwards to land in the court.

[In reality, top spin would help bring the ball down into the court.

6.



$V_x = 30 m/s$

$x_i = 0 m$
$x_f = ?$

$t_i = 0 s$
$t_f = ?$

$y_i = 1.5 m$
$y_f = 0 m$

$V_{iy} = 0 m/s$

$a_y = -9.8 m/s$

Find t_f first.

$$\cancel{y_f}^{\,0} = y_i + \cancel{V_{iy}\Delta t}^{\,0} + \tfrac{1}{2} a_y \Delta t^2$$

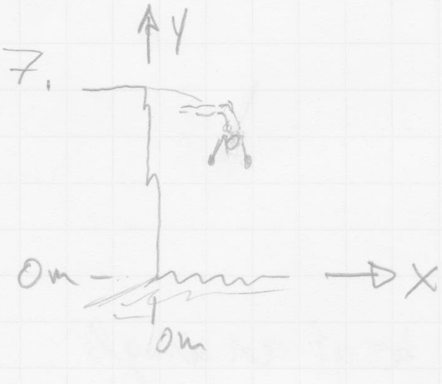
$$\Delta t = \sqrt{\frac{-2y_i}{a_y}} = \sqrt{\frac{-2(1.5m)}{-9.8 m/s^2}}$$

$$\Delta t = 0.55 s$$

$$x_f = x_i + V_x \Delta t = 0m + (30 m/s)(0.55 s)$$

$$\boxed{x_f = 16.6 m}$$

7.



$y_i = 20 m$ $V_{iy} = 0 m/s$ $t_i = 0 s$
$y_f = 0 m$ $V_{fy} = ?$ $t_f = ?$
$a_y = -9.8 m/s^2$

$x_i = 0 m$ $V_x = 4.25 m/s$
$x_f = ?$

a) $$\cancel{y_f}^{\,0} = y_i + \cancel{V_{iy}\Delta t}^{\,0} + \tfrac{1}{2} a_y \Delta t^2$$

$$\Delta t = \sqrt{\frac{-2y_i}{a_y}} = \sqrt{\frac{-2(20m)}{-9.8 m/s^2}} = 2.02 s$$

$$\boxed{\Delta t = 2.0 s}$$

p.251 7. (cont'd)

b) $X_f = X_i + V_x \Delta t = 0m + (4.25 m/s)(2.0s)$

$$\boxed{X_f = 8.5m}$$

c) $V_{fy} = V_{iy} + a\Delta t = 0 m/s + (-9.8 m/s^2)(2.0s)$

$V_{fy} = -19.6 m/s$

$V = \sqrt{V_{fx}^2 + V_{fy}^2} = \left[(4.25 m/s)^2 + (-19.6 m/s)^2\right]^{1/2}$

$V = 20 m/s$

8.

$y_i = 3m$ $V_{iy} = 0m$ $t_i = 0s$

$y_f = 0m$ $t_f = ?$

$a_y = -9.8 m/s$

$V_x = ?$ $X_i = 0m$ $X_f = 2.5m$

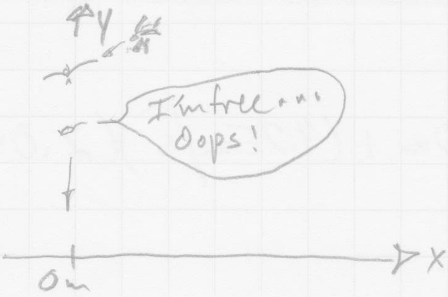
$y_f = y_i + V_i \Delta t + \frac{1}{2} a_y \Delta t^2$

$\Delta t = \sqrt{\frac{-2y_i}{a_y}} = \sqrt{\frac{-2(3m)}{-9.8 m/s^2}} = 0.78s$

$V_x = \frac{\Delta X}{\Delta t} = \frac{2.5m}{0.78s} = 3.2 m/s$

$$\boxed{V_x = 3.2 m/s}$$

9.



$y_i = 100\,m \quad V_{iy} = 0\,m/s \quad t_i = 0\,s$

$y_f = 0\,m \quad V_{fy} = ? \quad t_f = ?$

$a_y = -9.8\,m/s^2$

$X_i = 0\,m \quad V_x = 30\,\frac{km}{h}\left(\frac{1000\,m}{1\,km}\right)\left(\frac{1\,h}{3600\,s}\right)$

$V_x = 8.33\,m/s$

a) $t_f = ?$

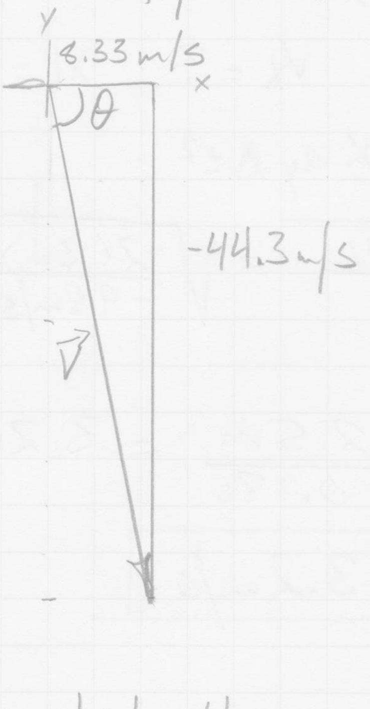
$$\cancel{y_f}^{\,0} = y_i + \cancel{V_{iy}}^{\,0}\Delta t + \tfrac{1}{2}a_y\Delta t^2$$

$$\Delta t = \sqrt{\frac{-2y_i}{a_y}} = \sqrt{\frac{-2(100\,m)}{-9.8\,m/s^2}}$$

$$\boxed{\Delta t = 4.52\,s}$$

b) $V_{fy} = V_{iy} + a_y\Delta t = 0\,m/s + (-9.8\,m/s^2)(4.52\,s)$

$V_{fy} = -44.3\,m/s$



$$\theta = \tan^{-1}\left(\frac{V_y}{V_x}\right) = $$

$$= \tan^{-1}\left(\frac{-44.3\,m/s}{8.33\,m/s}\right)$$

$$\theta = -79.4^\circ$$

The mouse hits the ground at 79.4° below the horizontal or 10.65° from the vertical.

$\boxed{\theta = 281^\circ}$ trig angle (ouch!)