

2.24)

a)

$$v_0 = 0$$

$$a = 4g$$

$$x_0 = 0 \text{ m}$$

$$v = 4 \text{ Mach}$$

$$a = 4g$$

$$x = ?$$



$$v^2 = v_0^2 + 2a(x - x_0)$$

$$v^2 = 2ax$$

$$x = \frac{v^2}{2a} = \frac{(4(331))^2}{2(9.81)} = 2236.5953 \text{ m}$$

b)

$$v_0 = 0$$

$$a = 4g$$

$$t_0 = 0 \text{ s}$$

$$v = 4 \text{ Mach}$$

$$a = 4g$$

$$t = ?$$

$$v_x = v_0 + at$$

$$v_x = at$$

$$t = \frac{v_x}{a} = \frac{4(331 \text{ m/s})}{4(9.81 \text{ m/s}^2)} = 33.74108 \text{ s}$$

2.26)



$$v_{0y} = 2 \text{ m/s}$$

$$y_0 = 5 \text{ cm}$$

$$a = -g$$

$$v_y = 1.3 \text{ m/s}$$

$$y = 5 \text{ cm} + 2 \text{ cm} = 7 \text{ cm}$$

$$a) v_y^2 = v_{0y}^2 + 2a_y \Delta y \Rightarrow a_y = \frac{v_y^2 - v_{0y}^2}{2 \Delta y}$$

$$a_y = \frac{(1.3 \text{ m/s})^2 - (2 \text{ m/s})^2}{2(0.07 \text{ m} - 0.05 \text{ m})}$$

$$a_y = -57.75 \text{ m/s}^2$$

$$b) v_y = v_{0y} + a_y t \Rightarrow t = \frac{v_y - v_{0y}}{a_y} = \frac{1.3 \text{ m/s} - 2 \text{ m/s}}{-57.75 \text{ m/s}^2}$$

$$t = 0.01212 \text{ s}$$

2.33)



$$a = cbc$$

$$v_0 = 0 \text{ m/s}$$

$$x_0 = 0 \text{ m}$$

$$v_1 = 3.8 \text{ m/s}$$

$$x_1 = 6.8 \text{ m}$$

$$v_2 = ?$$

$$x_2 = 340 \text{ m}$$

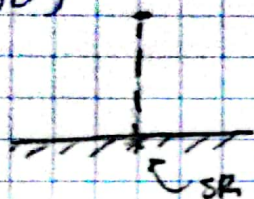
$$v_x^2 = v_{0x}^2 + 2a\Delta x \Rightarrow a = \frac{v_x^2 - v_{0x}^2}{2\Delta x} = \frac{(3.8 \text{ m/s})^2}{2(6.8 \text{ m})}$$

$$a = 1.06176 \text{ m/s}^2$$

$$v_x^2 = 2a\Delta x$$

$$v_x = \sqrt{2a(x_2 - x_0)} = \sqrt{2ax_2} = 26.87 \text{ m/s}$$

2.35)



$$a_y = -g$$

$$y_0 = 0$$

$$v_{0y} = 0$$

$$y_1 = 0.440 \text{ m}$$

$$v_{1y} = 0 \text{ m/s}$$

$$a) \ v_y^2 = v_{0y}^2 + 2a_y\Delta y \Rightarrow v_{0y}^2 = -2a_y\Delta y$$

$$v_{0y} = \sqrt{-2a_y\Delta y} = \sqrt{2g(y_1 - y_0)}$$

$$v_{0y} = \sqrt{2gy_1} = 2.9381 \text{ m/s}$$

$$b) \ v_y = v_{0y} + a_y t$$

$$0 = -v_{0y} + a_y t = -v_{0y} + (-g)t \Rightarrow t = \frac{v_{0y}}{g} = \frac{2.9381 \text{ m/s}}{9.81 \text{ m/s}^2} = 0.2995 \text{ s}$$