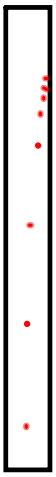
Homework for Thursday 9/13
P. 74 # 44, 45 and P. 82 # 97, 100, 101

$v_i = 0$ m/s Earth's $a = 9.8 \frac{m}{s^2}$ "g"

44. A student drops a tennis ball from a window 3.5 m above the sidewalk. How fast is it moving when it hits the sidewalk?

$v_f = ?$ d



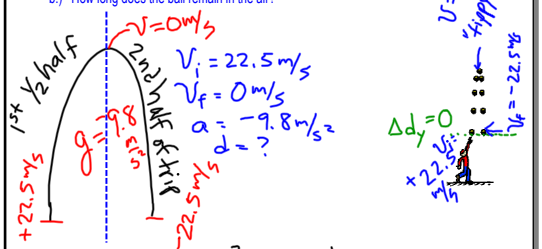
$$v_f^2 = v_i^2 + 2ad$$

$$v_f^2 = 0 + 2\left(9.8 \frac{m}{s^2}\right)(3.5\,m)$$

$$v_f = 8.3 \text{ m/s}$$

HAPPY LAND

45. A student throws a tennis ball straight up with an initial speed of 22.5 m/s. It is caught at exactly the same distance above the ground.
a.) How high does the ball rise?
b.) How long does the ball remain in the air?



$$\frac{v_f^2 - v_i^2}{2a} = d$$

$$v_f^2 = v_i^2 + 2ad$$

$$0^2 = \left(22.5 \frac{m}{s}\right)^2 + 2\left(-9.8 \frac{m}{s^2}\right)(d)$$

$d = 25.8$ m high

How Long in the air?

$d_y = v_{iy}t + \frac{1}{2}at^2$ distance formula

$$0 = 22.5 \frac{m}{s} t + \frac{1}{2}\left(-9.8 \frac{m}{s^2}\right)t^2$$

$$0 = 22.5t - 4.9t^2$$

$$4.9t^2 = 22.5t$$

$$t = \frac{22.5 \text{ m/s}}{4.9 \text{ m/s}^2} = 4.6 \text{ s}$$

97. Suppose an astronaut drops a feather from 1.2 m above the surface of the Moon. If the acceleration due to gravity is 1.62 m/s^2 downward, how long does it take the feather to hit the Moon's surface?

$d_y = -1.2\,m$ $\quad a = -1.62\,m/s^2$

$v_{iy} = 0\,m/s$ $\quad t = ?$

$d_y = \cancel{v_{iy}t}^{0} + \frac{1}{2}at^2$

$d_y = \frac{1}{2}at^2 \Rightarrow t = \sqrt{\frac{2d}{a}}$

$1.2\,s = t = \sqrt{\frac{2(-1.2m)}{-1.62\,m/s^2}}$

100. You throw a ball downward from a window at a speed of 2.0 m/s. How fast will it be moving when it hits the sidewalk 2.5 m below?

101. If you throw the ball upward with an initial velocity of 2.0 m/s (from previous problem) how fast will it be moving when it hits the sidewalk 2.5 m below?