$$y = 2.25t^2$$

$$y = y_0 + V_{y0}t + \frac{1}{2}a_y t^2$$

compare these two, we get

$$\frac{1}{2}a_y = 2.25, \quad y_0 = 0$$

$$a_y = 4.50\ m/s^2 \quad V_{y0} = 0$$

$$V_y = v_{y0} + a_y t$$

$$V_y = a_y t$$

at $t = 2.1$ s,

$$V_y = (4.5\ \frac{m}{s^2})(2.1\ s)$$

$$= 9.5\ m/s$$

Sep 7-9:30 AM

Alternative Solution

$$V_y = \frac{dy}{dt} = \frac{d}{dt}(2.25t^2)$$

$$= 4.5t$$

At $t = 2.1$ s, $V_y = (4.5\ m/s^2)(2.1\ s)$

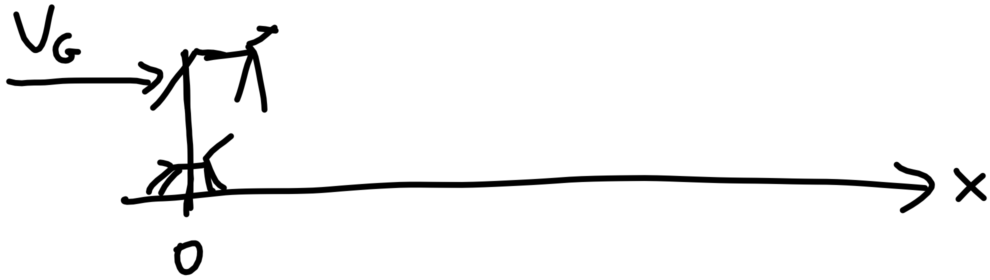
$$= 9.5\ m/s$$

Sep 7-9:55 AM

Example 3.13, Cheetah & Gazelle

Let x_c = position of cheetah (v_c, a_c)

x_G = " " gazelle (v_G, a_G)



v_G = constant = 10 m/s. $a_G = 0$

$x_{c0} = \emptyset$ $v_{c0} = \emptyset$

$x_{G0} = \emptyset$ $a_c = 4 \text{ m/s}^2$

Sep 7-10:03 AM

$$x_G = \cancel{x_{G0}}^{0} + v_{G0}t + \frac{1}{2}\cancel{a_G}^{0}t^2$$

$$x_c = \cancel{x_{c0}}^{0} + \cancel{v_{c0}}^{0}t + \frac{1}{2}a_c t^2$$

put in our ~~values,~~ (zeroes)

$$\left.\begin{aligned} x_G &= v_G t \\ x_c &= \frac{1}{2}a_c t^2 \end{aligned}\right]$$

at what time does $x_G = x_c$?

$v_G t = \frac{1}{2}a_c t^2$ $t = \frac{2v_G}{a_c}$

Sep 7-10:08 AM

Gravitational Force

$$F = G\frac{Mm}{r^2}$$

const. (G)

But $F = ma$

set equal, $\cancel{m}a = G\frac{M\cancel{m}}{r^2}$

$$a = G\frac{M}{r^2} \approx \text{const.}$$

near Earth's surface $\longrightarrow a = g = 9.8\ \text{m/s}^2$

Sep 7-10:15 AM

For free fall, use equations of motion, and substitute for a

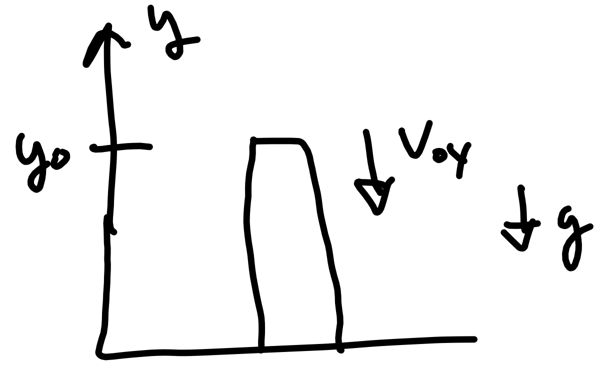
i) $a = -g$ if $+y$ is upward from surface

$\uparrow y \quad \downarrow g$

ii) $a = g$ if $+y$ is downward $\downarrow y \quad \downarrow g$

Sep 7-10:22 AM

Ex 3.14



$$y = y_0 + V_{oy}t + \frac{1}{2}a_y t^2 \text{ where } a_y = -g$$

$$y = y_0 + V_{oy}t - \frac{1}{2}g t^2$$

when ball hits ground, $y = \phi$

$$\left. 0 = y_0 + V_{oy}t - \frac{1}{2}g t^2 \right\} \text{ use quadratic equation (use only } \underline{\text{one}} \text{ root!)}$$

Sep 7-10:26 AM