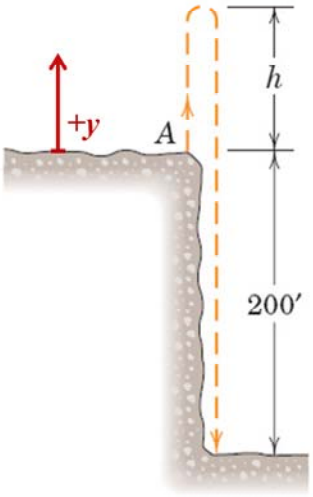
Integrating Acceleration: Exercise

Case #1: constant *acceleration*

A ball is thrown vertically with a ***velocity*** of 80 ft/s at the edge of a 200-ft cliff.

Calculate the ***height*** (***h***) the ball rises and the total ***time*** (***t***) to reach the bottom of the cliff.

Neglect air resistance and take ***acceleration*** as ***a*** = 32.2 ft/s^2.



2/10 $+\uparrow y$

$y = v_0 t + \frac{1}{2} a t^2$, $y = 80t - \frac{1}{2} 32.2 t^2$

for $y = -200$ ft,

$-200 = 80t - 16.1 t^2$

or $16.1 t^2 - 80t - 200 = 0$

$$t = \frac{80 \pm \sqrt{(80)^2 + 4(16.1)(200)}}{2(16.1)} = \underline{6.80 \text{ sec}} \quad (\text{or } -1.83 \text{ s})$$

For $\dot{y} = 0$, $v^2 = v_0^2 + 2ay$, $y = h = \frac{0 - 80^2}{-2(32.2)} = \underline{99.4 \text{ ft}}$