

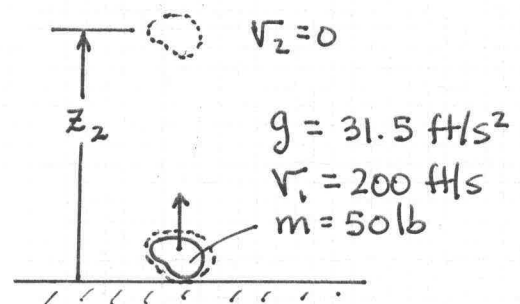
PROBLEM 2.14

KNOWN: An object of known mass is projected upward from the surface of the earth with a known initial velocity. The only force acting on the object is the force of gravity.

FIND: Plot the velocity of the object versus elevation and determine the elevation when its velocity reaches zero.

SCHEMATIC & GIVEN DATA:

ENGR. MODEL: (1) The object is a closed system. (2) The acceleration of gravity is constant. (3) The only force acting on the object is the force of gravity.



ANALYSIS: Since the only force acting on the body is the force of gravity, Eq. 2.11 applies. Thus, the velocity and elevation are related to the initial condition by

$$\frac{1}{2} m V^2 + m g z = \frac{1}{2} m V_1^2 + m g z_1$$

Thus, solving for V

$$V = \sqrt{V_1^2 - 2 g z} \quad \leftarrow \text{Expression for } V \text{ in terms of } z$$

When $V_2 = 0$, z_2 is

$$z_2 = \frac{V_1^2}{2g} = \frac{200^2 \text{ ft}^2/\text{s}^2}{2(31.5 \text{ ft/s}^2)} = 634.92 \text{ ft} \quad \leftarrow z_2$$

Plotting the above relationship

