

PROBLEM 1.16

The FBD of the object is as shown with an upward applied force of 10 lbf and the force downward due to gravity where $F_{\text{grav}} = mg$ and g is given as 32.2 ft/s^2 . Summing forces yields the following equation that can be rearranged to solve for acceleration. It is assumed that up is positive.

$$F_{\text{applied}} = 10 \text{ lbf}$$

$$m = 50 \text{ lb}$$

$$g = 32.2 \frac{\text{ft}}{\text{s}^2}$$

$$a = ? \frac{\text{ft}}{\text{s}^2}$$

$$F_{\text{applied}} - F_{\text{grav}} = ma$$

$$F_{\text{grav}} = mg$$

$$a = \frac{F_{\text{applied}} - F_{\text{grav}}}{m} = \frac{F_{\text{applied}} - mg}{m} = \frac{F_{\text{applied}}}{m} - g$$

$$a = \frac{10 \text{ lbf}}{50 \text{ lb}} \left| \frac{32.2 \text{ ft} \cdot \text{lb} / \text{s}^2}{1 \text{ lbf}} \right| - 32.2 \frac{\text{ft}}{\text{s}^2}$$

$$a = -25.8 \frac{\text{ft}}{\text{s}^2} \quad \text{downward}$$

