

# PHYS 407

1.

yes because the rocket ~~is~~ weighs less

2.

yes, it could change the velocity

3.

~~the ground~~ yes, the ground is the system

4.

$$m \mathbf{V}_i = m_a \mathbf{V}_{af} + m_{RR} \mathbf{V}_{RRf} + m_R \mathbf{V}_{Rf}$$

$$\mathbf{V}_{RRf} = \frac{m \mathbf{V}_i - m_a \mathbf{V}_{af} - m_R \mathbf{V}_{Rf}}{m_{RR}}$$

$$\mathbf{V}_{RRf} = \frac{5}{3} [30\hat{x} + 20\hat{y} + 200\hat{z}] - \frac{1}{3} [-40\hat{x} - 20\hat{y} + 50\hat{z}] - \frac{1}{3} [35\hat{x} + 30\hat{y} + 50\hat{z}]$$

$$= [51.7\hat{x} + 30\hat{y} + 300\hat{z}] \text{ m/s}$$

5.

$$(51.7\hat{x} + 30\hat{y} + 300\hat{z}) - (-40\hat{x} - 20\hat{y} + 50\hat{z})$$

$$= (91.7\hat{x} + 50\hat{y} + 250\hat{z}) \text{ m/s}$$

6.

$$\Delta z = \frac{1}{2} a t^2 + V_{iz} t \rightarrow -3000 = 4.9 t^2 + 250 t \quad t = 61.05 \text{ seconds}$$

$$\Delta x = V_{ix} t \rightarrow \Delta x = 5598.29 \text{ m}$$

$$\Delta y = V_{iy} t \rightarrow \Delta y = 3052.5 \text{ m}$$

$$\theta = 28.59$$

