

10. We use Eq. 4-15 with  $\vec{v}_1$  designating the initial velocity and  $\vec{v}_2$  designating the later one.

(a) The average acceleration during the  $\Delta t = 4$  s interval is

$$\vec{a}_{\text{avg}} = \frac{(-2\hat{i} - 2\hat{j} + 5\hat{k}) - (4\hat{i} - 22\hat{j} + 3\hat{k})}{4} = -1.5\hat{i} + 0.5\hat{k}$$

in SI units ( $\text{m/s}^2$ ).

(b) The magnitude of  $\vec{a}_{\text{avg}}$  is  $\sqrt{(-1.5)^2 + 0.5^2} = 1.6$   $\text{m/s}^2$ . Its angle in the  $xz$  plane (measured from the  $+x$  axis) is one of these possibilities:

$$\tan^{-1}\left(\frac{0.5}{-1.5}\right) = -18^\circ \quad \text{or} \quad 162^\circ$$

where we settle on the second choice since the signs of its components imply that it is in the second quadrant.