

16. All distances in this solution are understood to be in meters.

(a)  $\vec{a} + \vec{b} = (3.0\hat{i} + 4.0\hat{j}) + (5.0\hat{i} - 2.0\hat{j}) = 8.0\hat{i} + 2.0\hat{j}$ .

(b) The magnitude of  $\vec{a} + \vec{b}$  is

$$|\vec{a} + \vec{b}| = \sqrt{8.0^2 + 2.0^2} = 8.2 \text{ m} .$$

(c) The angle between this vector and the  $+x$  axis is  $\tan^{-1}(2.0/8.0) = 14^\circ$ .

(d)  $\vec{b} - \vec{a} = (5.0\hat{i} - 2.0\hat{j}) - (3.0\hat{i} + 4.0\hat{j}) = 2.0\hat{i} - 6.0\hat{j}$ .

(e) The magnitude of the difference vector  $\vec{b} - \vec{a}$  is

$$|\vec{b} - \vec{a}| = \sqrt{2.0^2 + (-6.0)^2} = 6.3 \text{ m} .$$

(f) The angle between this vector and the  $+x$  axis is  $\tan^{-1}(-6.0/2.0) = -72^\circ$ . The vector is  $72^\circ$  *clockwise* from the axis defined by  $\hat{i}$ .