

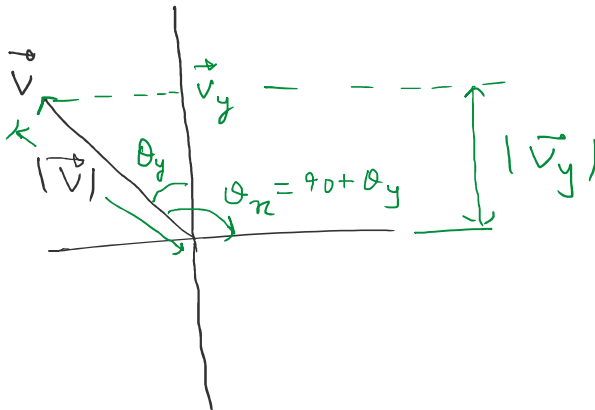
## Statics Problem Solutions

1/1 Determine the angles made by the vector  $\mathbf{V} = -36\mathbf{i} + 15\mathbf{j}$  with the positive x- and y-axes. Write the unit vector  $\mathbf{n}$  in the direction of  $\mathbf{V}$ .

**1/1** Determine the angles made by the vector  $\mathbf{V} = -36\mathbf{i} + 15\mathbf{j}$  with the positive x- and y-axes. Write the unit vector  $\mathbf{n}$  in the direction of  $\mathbf{V}$ .

$$\text{Ans. } \theta_x = 157.4^\circ, \theta_y = 67.4^\circ$$
$$\mathbf{n} = -0.923\mathbf{i} + 0.385\mathbf{j}$$

Solution:



$$\cos \theta_y = \frac{|V_y|}{|V|} = \frac{15}{39} \Rightarrow \theta_y = 67.4^\circ$$

$$\left[ \begin{array}{l} \vec{V} = -36\hat{i} + 15\hat{j} \\ \quad = \vec{V}_x\hat{i} + \vec{V}_y\hat{j} \\ \Rightarrow |V_x| = -36; |V_y| = 15 \\ |\vec{V}| = \sqrt{(-36)^2 + (15)^2} = 39 \end{array} \right]$$

$$\theta_x = \theta_y + 90^\circ = 67.4 + 90^\circ = 157.4^\circ$$

$$\hat{n} = \frac{\vec{V}}{|\vec{V}|} = \frac{V_x\hat{i} + V_y\hat{j} + V_z\hat{k}}{\sqrt{|V_x|^2 + |V_y|^2 + |V_z|^2}}$$

$$\vec{V} = -36\hat{i} + 15\hat{j} + 0\hat{k}$$

$$\Rightarrow |V_x| = 36; |V_y| = 15$$

$$\Rightarrow |\vec{V}| = \sqrt{(-36)^2 + (15)^2} = 39$$

$$\Rightarrow \hat{n} = \frac{-36}{39}\hat{i} + \frac{15}{39}\hat{j} + \frac{0}{39}\hat{k}$$

$$\Rightarrow \hat{n} = -0.923\hat{i} + 0.385\hat{j}$$

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