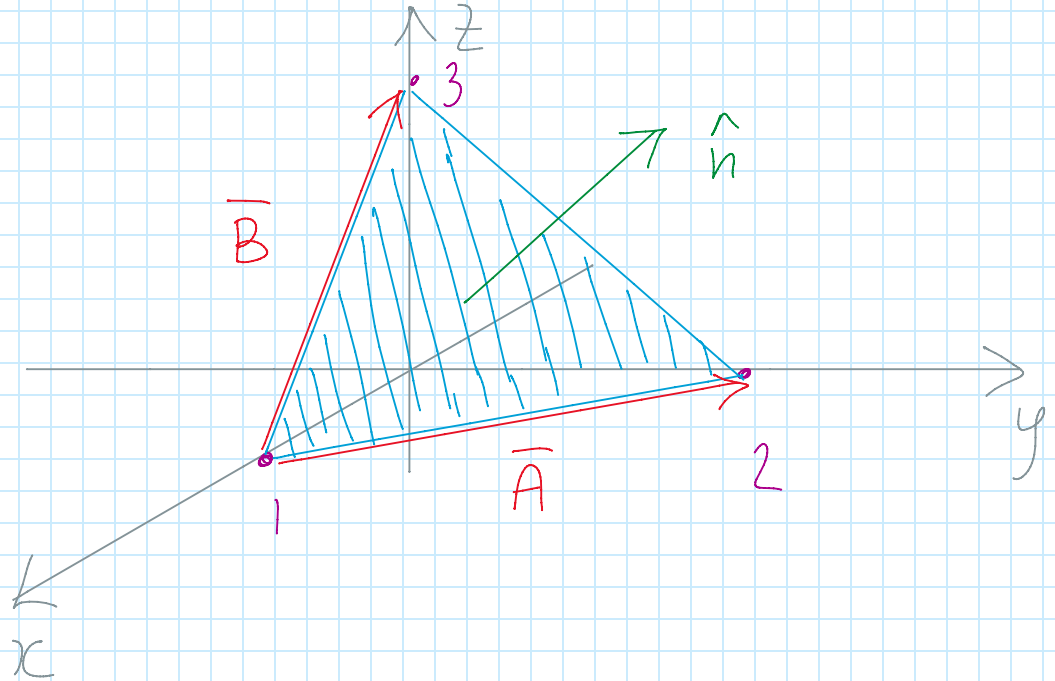


Cross products

Thursday, January 27, 2022 9:09 AM

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Use the cross product to find the components of the unit vector perpendicular to the shaded area in the figure



$$\vec{A} = -\hat{i} + 2\hat{j}$$

$$\vec{B} = -\hat{i} + 3\hat{k}$$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & 2 & 0 \\ -1 & 0 & 3 \end{vmatrix} = 6\hat{i} + 3\hat{j} + 2\hat{k}$$

$$|\vec{A} \times \vec{B}|^2 = 36 + 9 + 4 = 49 = 7^2$$

$$\hat{n} = \frac{\vec{A} \times \vec{B}}{|\vec{A} \times \vec{B}|} = \frac{6}{7}\hat{i} + \frac{3}{7}\hat{j} + \frac{2}{7}\hat{k}$$

check

$$|\hat{n}|^2 = \frac{1}{49}(36 + 9 + 4) = 1 \quad \checkmark$$

$$\hat{n} \cdot \vec{A} = -\frac{6}{7} + \frac{6}{7} = 0 \quad \checkmark$$

$$\hat{n} \cdot \vec{B} = -\frac{6}{7} + \frac{6}{7} = 0 \quad \checkmark$$