

Main Questions Part E

Brute Cracking
dq601

①

$$\frac{1}{a) \vec{AB} = \begin{pmatrix} 3 \\ 0 \\ -4 \end{pmatrix}}$$

$$\vec{BC} = \begin{pmatrix} 0 \\ -4 \\ 0 \end{pmatrix}$$

$$n = \begin{pmatrix} 3 \\ 0 \\ -4 \end{pmatrix} \wedge \begin{pmatrix} 0 \\ -4 \\ 0 \end{pmatrix} = \begin{vmatrix} i & j & k \\ 3 & 0 & -4 \\ 0 & -4 & 0 \end{vmatrix} = \begin{pmatrix} -16 \\ 0 \\ -12 \end{pmatrix}$$

$$|n| = 20 \rightarrow \hat{n} = \begin{pmatrix} -4/5 \\ 0 \\ -3/5 \end{pmatrix}$$

b) Find A:

$$|\vec{AB}| = 5$$

$$|\vec{BC}| = 4$$

$$\rightarrow A = 5 \times 4 = \underline{20}$$

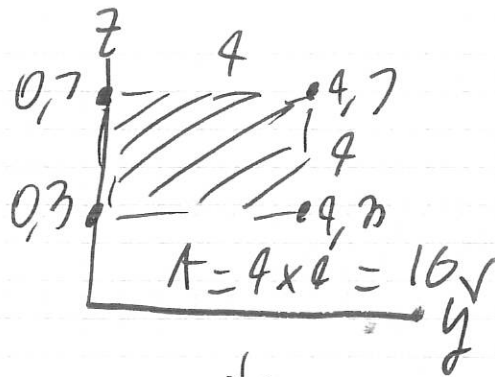
$$\rightarrow S = 20 \times \begin{pmatrix} -4/5 \\ 0 \\ -3/5 \end{pmatrix} \rightarrow \begin{pmatrix} 16 \\ 0 \\ 12 \end{pmatrix}$$

c) $S \cdot \hat{i}$

$$= \begin{pmatrix} 16 \\ 0 \\ 12 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = 16$$



$$\underline{16 = 16 \checkmark}$$

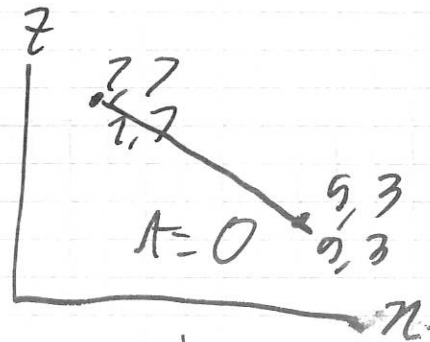


d) $S \cdot \hat{j}$

$$= \begin{pmatrix} 16 \\ 0 \\ 12 \end{pmatrix} \cdot \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} = 0$$



$$\underline{0 = 0 \checkmark}$$

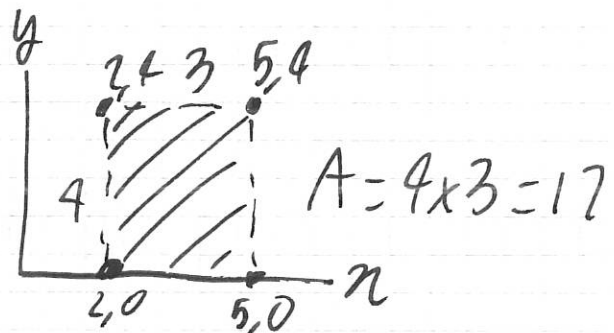


e) $S \cdot \hat{k}$

$$= \begin{pmatrix} 16 \\ 0 \\ 12 \end{pmatrix} \cdot \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = 12$$



$$\underline{12 = 12 \checkmark}$$



(3)

$$\vec{OB} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\vec{OD} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

$$\rightarrow \text{Area of } OBOD = 2 \times 2 = 4$$

$$\text{Normal to } OBOD = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

$$\rightarrow \cancel{\left(\frac{10}{4} \right)} \hat{n} \cdot \frac{1}{\sqrt{2}} \begin{pmatrix} 0 \\ -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} 0 \\ -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix}$$

$$= \cancel{\sqrt{2}} \sqrt{2}$$

$$\rightarrow \text{Vector area} = \begin{pmatrix} 0 \\ 0 \\ 4\sqrt{2} \end{pmatrix} ?$$

Unsure what question is asking

$$b) \text{ Vector area of } OBOD = \begin{pmatrix} 0 \\ 0 \\ 4 \end{pmatrix}$$

$$\rightarrow \text{Vector area of upper} = 0 - \begin{pmatrix} 0 \\ 0 \\ 4 \end{pmatrix} = \boxed{\begin{pmatrix} 0 \\ 0 \\ -4 \end{pmatrix}} ?$$

c) Normal to both ends = $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$

(7)

Area of Top: $25\pi \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 25\pi \end{pmatrix}$

Area of Bottom: $5\pi \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 5\pi \end{pmatrix}$

→ Area of lampshade = $O - T - B = \begin{pmatrix} 0 \\ 0 \\ -34\pi \end{pmatrix}$