

$$1x \quad A = (0, 0, 0) \quad B = (1, 2, 2) \quad C = (-4, 0, 2)$$

$$\vec{AB} = B - A = (1, 2, 2) \quad \vec{AC} = (-4, 0, 2)$$

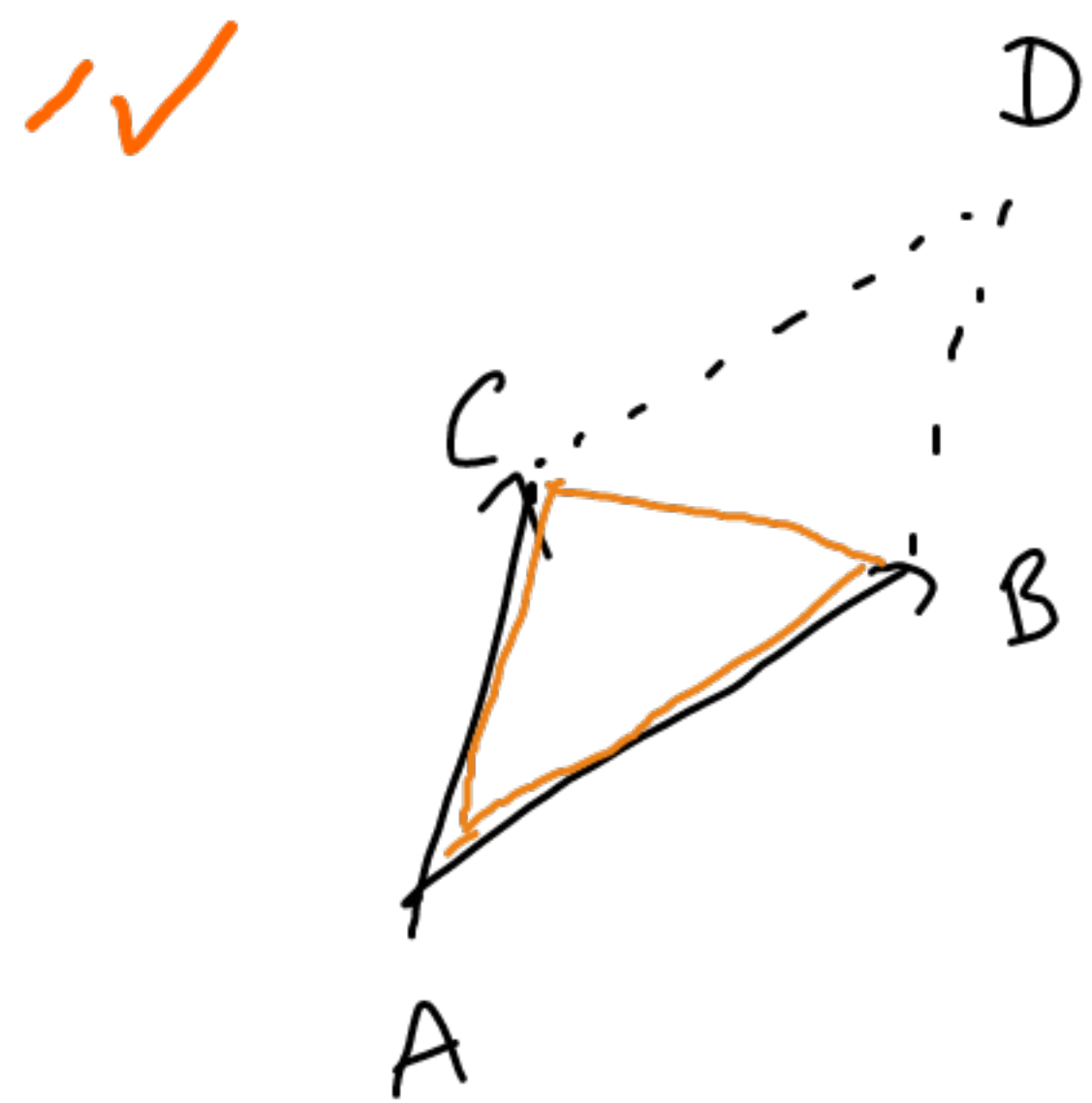
$$\vec{BC} = C - A = (-4, 0, 2)$$

$$\vec{BC} = (-5, -2, 0)$$

$$S_{\Delta} = \frac{1}{2} \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 2 & 2 \\ -4 & 0 & 2 \end{vmatrix} = \frac{1}{2} \left(\begin{matrix} +4i & -8j \\ -8k & +2j \end{matrix} \right) = \frac{1}{2} \left(\begin{matrix} +4i & -8j & +8k \\ +4i & -10j & +8k \end{matrix} \right) = \frac{1}{2} \left(+4i + 8k - 10j \right) = \frac{1}{2} \left(4, -10, 8 \right) = \frac{1}{2} \sqrt{16 + 64 + 100} = 2\sqrt{5} \text{ (j}^2 \text{)}$$

$$(4, -10, 8) \cdot (1, 2, 2) = 4 + 16 - 20 = 0$$

$$(4, -10, 8) \cdot (-4, 0, 2) = -16 + 16 = 0$$



$$P_{\Delta ABCD} = |\vec{AB} \times \vec{AC}|$$

$$P_{\Delta ABC} = \frac{1}{2} |\vec{AB} \times \vec{AC}|$$