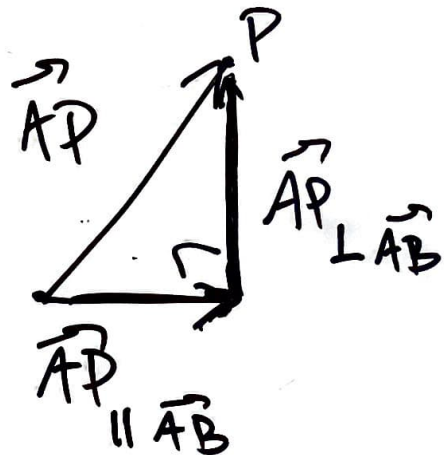
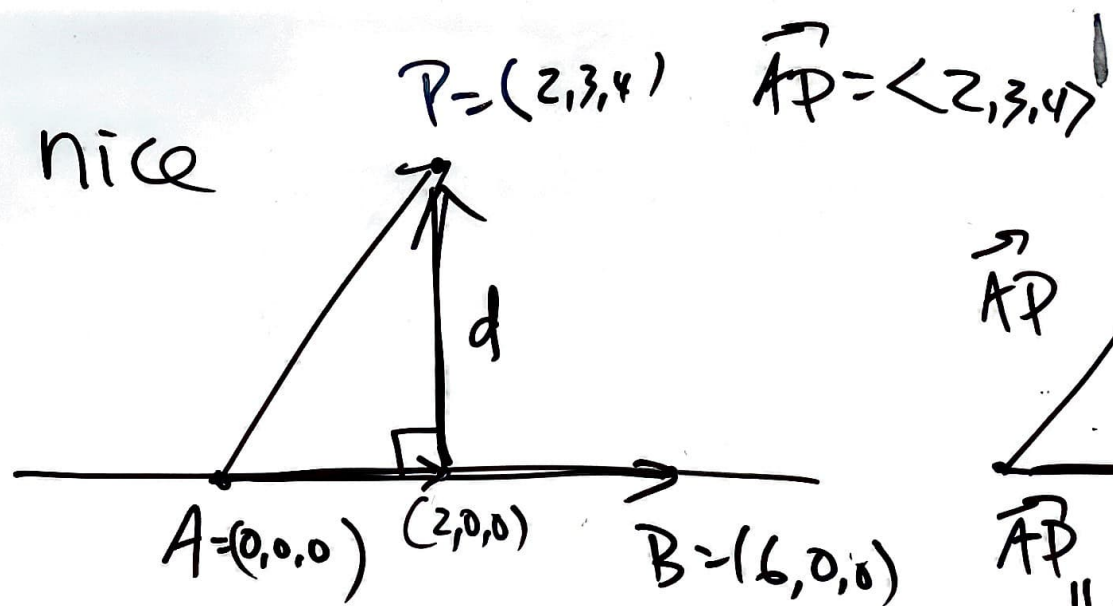


Prob 9 with nice

$$A = (0, 0, 0)$$

$$B = (6, 0, 0)$$

$$P = (2, 3, 4)$$



$d$  is the distance from  $P$  to the line through  $A$  &  $B$

$d = \|\vec{AP} \perp \vec{AB}\|$ , the length of the projection of  $\vec{AP}$  orthogonal to  $\vec{AB}$

$$\vec{AP} \parallel \vec{AB} = \langle 2, 0, 0 \rangle, \quad \vec{AP} \perp \vec{AB} = \langle 0, 3, 4 \rangle \quad \langle 2, 3, 4 \rangle = \langle 2, 0, 0 \rangle + \langle 0, 3, 4 \rangle$$

$$\vec{AP} \parallel \vec{AB} = \frac{(\vec{AP} \cdot \vec{AB}) \vec{AB}}{\|\vec{AB}\|^2}$$

$$\vec{a} = \vec{AB}$$

$$\vec{b} = \vec{AP}$$

$$= \frac{(\langle 2, 3, 4 \rangle \cdot \langle 6, 0, 0 \rangle) \langle 6, 0, 0 \rangle}{\|\langle 6, 0, 0 \rangle\|^2}$$

in website formula.

$$= \frac{(12 + 0 + 0) \langle 6, 0, 0 \rangle}{36 + 0 + 0} = \frac{12}{36} \langle 6, 0, 0 \rangle = \langle 2, 0, 0 \rangle$$

$$\vec{AP} \perp \vec{AB} = \vec{AP} - \vec{AP} \parallel \vec{AB}$$

$$\parallel \vec{AB} = \langle 2, 3, 4 \rangle - \langle 2, 0, 0 \rangle = \langle 0, 3, 4 \rangle$$

$$d = \|\langle 0, 3, 4 \rangle\| = \sqrt{0^2 + 3^2 + 4^2} = \sqrt{25} = 5$$