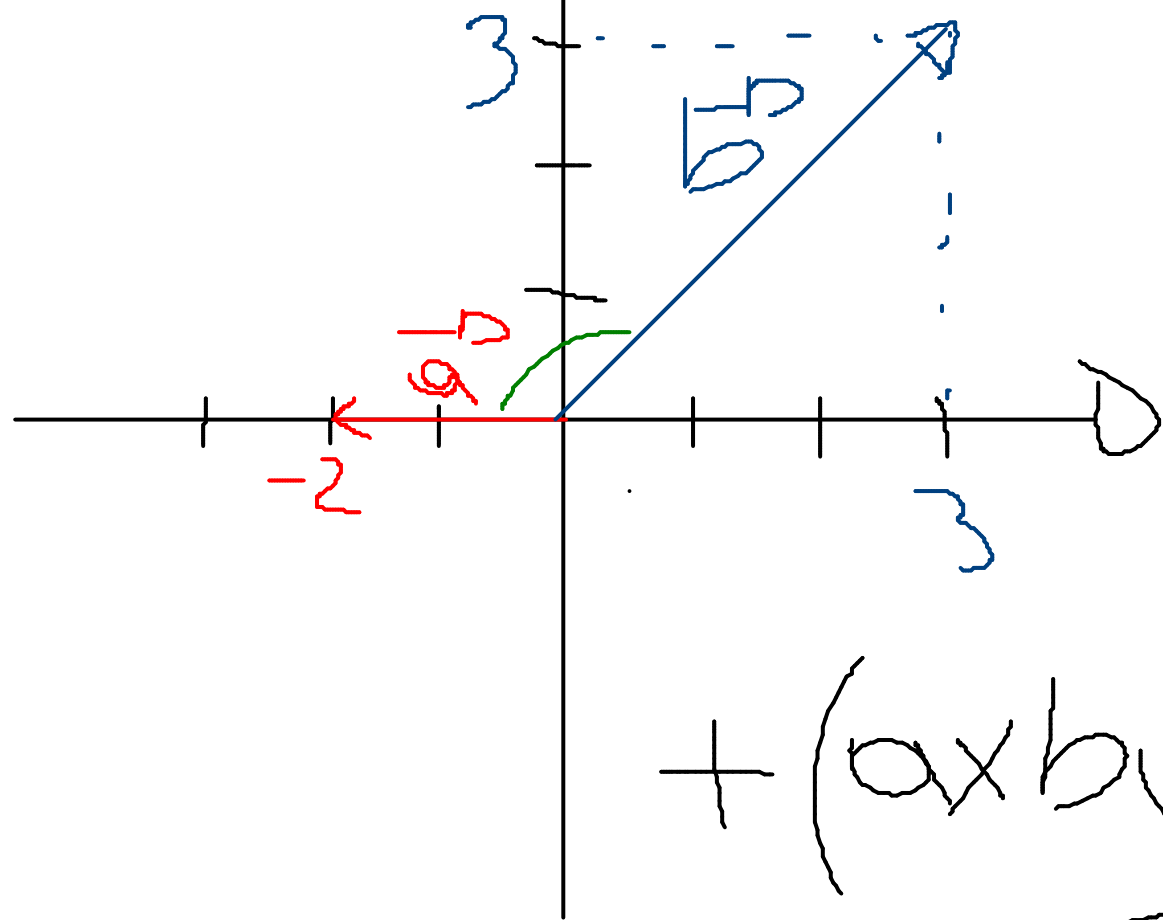


$$\begin{aligned}
 \vec{a} \times \vec{b} &= (a_x \hat{x} + a_y \hat{y} + a_z \hat{z}) \times (b_x \hat{x} + b_y \hat{y} + b_z \hat{z}) \\
 &= \cancel{a_x b_x \hat{x} \times \hat{x}} + a_x b_y \hat{x} \times \hat{y} + a_x b_z \hat{x} \times \hat{z} \\
 &\quad + \cancel{a_y b_x \hat{y} \times \hat{x}} + \cancel{a_y b_y \hat{y} \times \hat{y}} + a_y b_z \hat{y} \times \hat{z} \\
 &\quad + \cancel{a_z b_x \hat{z} \times \hat{x}} + \cancel{a_z b_y \hat{z} \times \hat{y}} + \cancel{a_z b_z \hat{z} \times \hat{z}} \\
 &= (a_y b_z - a_z b_y) \hat{x} + (a_z b_x - a_x b_z) \hat{y} + (a_x b_y - a_y b_x) \hat{z}
 \end{aligned}$$

$$\begin{aligned}
 &(a_y b_z - a_z b_y) \hat{x} + (a_z b_x - a_x b_z) \hat{y} + \\
 &(a_x b_y - a_y b_x) \hat{z}
 \end{aligned}$$

$$\vec{a} = (-2, 0) \quad \vec{b} = (3, 3) \quad \vec{a} \times \vec{b} = ? \quad \gamma = \frac{3\pi}{4}$$

$$|\vec{a} \times \vec{b}| = ab \sin \gamma = 2 \cdot 3 \sqrt{2} \cdot \frac{\sqrt{2}}{2} = 6$$



~~$$(a_1 b_2 - a_2 b_1) \hat{x} + (a_2 b_x - a_x b_2) \hat{y} +$$~~

$$+ (a_x b_y - a_y b_x) \hat{z} = (-2)(3) - (0)(3) \\ = -6 - 0 = -6$$

$$\vec{a} = \left(\frac{1}{2}, \frac{3}{2}\right) \quad \vec{b} = \left(\frac{3}{2}, \frac{1}{2}\right) \quad \gamma = \frac{\pi}{2}$$

$$a = \sqrt{\frac{1}{4} + \frac{9}{4}} = \frac{\sqrt{10}}{2} \quad b = \sqrt{\frac{9}{4} + \frac{1}{4}} = \frac{\sqrt{10}}{2}$$

$$|\vec{a} \times \vec{b}| = ab \sin \gamma = \frac{\sqrt{10}}{2} \cdot \frac{\sqrt{10}}{2} \cdot 1 = \frac{10}{4} = \frac{5}{2}$$

$$\begin{aligned} (a_x b_y - a_y b_x) \hat{z} &= \left(\frac{1}{2}\right)\left(\frac{1}{2}\right) - \left(\frac{3}{2}\right)\left(\frac{3}{2}\right) = \\ &= \frac{1}{4} - \frac{9}{4} = -\frac{8}{4} = -2 \end{aligned}$$