3. 1. a) $\|u \times v\|$

We know u lies in first quadrant of xy plane

v lies on z axis

Thus angle between u, v is $90°$

$\|u \times v\| = \|u\| \|v\| \sin 90°$

$= \|u\| \times \|v\| = 15$ //

b) The cross product $u \times v$

Let $u = x\hat{i} + y\hat{j}$

$v = z\hat{k}$

$u \times v = yz\,\hat{i} - xz\,\hat{j}$

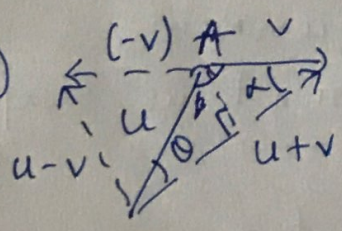
x coordinate is > 0 //

c) y coordinate $= (-xz)\hat{j}$

y coordinate is < 0 //

d) z coordinate $= 0$ //

2. a)



$|u| = 2\sqrt{2}$

$|v| = 2\sqrt{2}$

$|u - v| = 2\sqrt{2}$

We see the triangle formed by $u, -v, u - v$

=) Angle between each side is $60°$ as $|u| = |v| = |u - v|$

=) Angle between the sides $|u|, |v|$ is $120°$

$|u| = |v|$

=) Angle between sides $|u|, |u+v|$ is $30°$

Angle between sides $|v|, |u+v|$ is $30°$

We can see that the perpendicular on |u+v| passes from A.

$\Rightarrow |u+v| = |u|\cos\theta + |v|\cos\alpha$

$= 2\sqrt{2} \times \cos 60^\circ + 2\sqrt{2}\cos 60^\circ$

$= \sqrt{6} + \sqrt{6} = 2\sqrt{6}$ //

b) Angle b/w |u| & |v| is 60° //

because $\beta = 120^\circ$

3. a)

$$\begin{bmatrix} 1 & 3 & 2 \\ a & 6 & 2 \\ 0 & 9 & 5 \end{bmatrix}$$

Swap of rows can be done using elementary row operation

$R_x \to R_x - R_y \quad (R_y \Rightarrow R_y,\ R_x \Rightarrow R_x - R_y)$

$R_y \to R_y + R_x \quad (R_y \Rightarrow R_x,\ R_x \Rightarrow R_x - R_y)$

$R_x \Rightarrow R_x - R_y \quad (R_y \Rightarrow R_x,\ R_x \Rightarrow -R_y)$

-1 can be taken out common

It is never a compulsion to use swapping for any value of a.

∴ No possible value of a

b) $|A| = 0$

$\Rightarrow (30 - 18) + (-3)(-5a) + 2(9a) = 0$

$\Rightarrow a = -4$ //