3.2

Cauchy bhai

Eucledian distance= $d(u,v) = ||u-v||$

Q1 (a)- $||v|| = \sqrt{12} = 2\sqrt{3}$

$\hat{v} = -\frac{1}{2\sqrt{3}} (2,2,2)$

(b) $||v|| = \sqrt{1+4+1+9} = \sqrt{15}$

$\hat{v} = -\frac{1}{\sqrt{15}} (1,0,2,1,3)$

Q3- (d) $||3u-5v+w||$

$= ||(6,-6,9)-(5,-15,20)+(3,6,-4)||$
$= ||(4,15,-15)||$
$= \sqrt{466}$

Q5 (c) $|| -||u|| v ||$

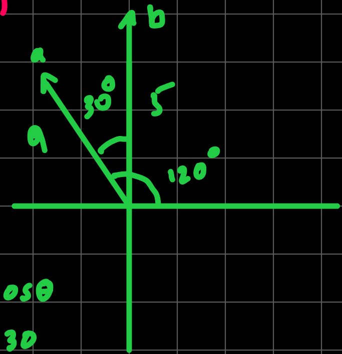
$= || \, ||(2,1,-4,-5)|| \, v ||$

$= || \sqrt{2^2+1^2+(-4)^2+(-5)^2} \; v ||$
$= || \sqrt{46} (3,1,-5,7) || = \sqrt{46} \left(\sqrt{9+1+25+49}\right)$
$= \sqrt{46} \cdot 2\sqrt{21} = 2\sqrt{966}$

Q7- $v = (-2,3,0,6)$; $||kv|| = 5$

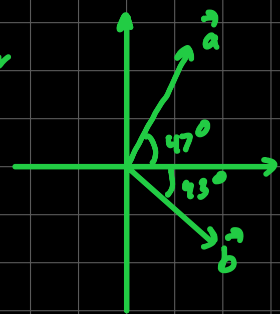
$k(7) = 5$
$k = \frac{5}{7} \Rightarrow k = \pm\frac{5}{7}$

Q13-



$a.b = |a||b| \cos\theta$
$= 5 \cdot 9 \cdot \cos 30$
$= \frac{45}{2}\sqrt{3}$

Q14- $a.b = 0$, as angle b/w the vectors $= 90°$



Q17- (a) $u.v = -6-1+0$
$= -7$
$|u.v| = 7$

$||u|| = \sqrt{10}$
$||v|| = \sqrt{14}$

$||u|| \, ||v|| = \sqrt{140}$ (holds) $7 < \sqrt{140}$

- Norm : $\|v\| = \sqrt{v_1^2 + v_2^2 + v_3^2 \dots v_n}$ in R^n
- $\|kv\| = \|k\| \|v\|$
- unit vector = $\frac{v}{\|v\|}$
- standard unit vectors: $i, j, k \dots \mid e_1, e_2, e_3 \dots$
- eucledian distance= $d(u,v) = \|u-v\|$
- dot product / euclidean inner product : $u.v = \|u\| \|v\| \cos\theta$: θ is in b/w u and v, such that $0 \le \theta \le \pi$
  - → $u.v > 0$, θ is acute
  - → $u.v < 0$, θ is obtuse
  - → $u.v = 0$, $\theta = \frac{\pi}{2}$

- Cauchy schwartz inequality: $|u.v| \le \|u\| \|v\|$
- $\|u+w\| \le \|u\| + \|w\|$
- $d(u,v) \le d(u,w) + d(w,v)$
- $\|u+v\|^2 + \|u-v\|^2 = 2(\|u\|^2 + \|v\|^2)$