laras_10223118

No #Homework-1

Date Kamis-12-Sep '24

Besaran & satuan

Pengukuran

Besaran & satuan

<sistem SI>

- Besaran pokok
  - panjang (m)
  - massa (kg)
  - waktu (s)
  - intensitas cahaya (cd)
  - suhu (K)
  - kuat arus (A)
- Besaran turunan
  - jumlah zat (mol)

Variasi satuan

→ 1 hp = 745,7 watt

Putaran mesin (rpm)

→ 1 rpm = $2\pi / 60$ rad/s

Kebisingan di pabrik (dB)

$I = \frac{P}{A}\left(\frac{W}{m^2}\right)$ → Taraf intensitas bunyi

$TI = 10 \log\left(\frac{I}{I_0}\right)$ (dB)

Notasi ilmiah & prefix

① 227×10^6 W → notasi ilmiah

227000000

227 MW → prefix

② 1×10^{-4} W → notasi ilmiah

0,00001 W

100 μW → prefix

Notasi ilmiah

$a \times 10^b$

↔ a: bil. riil

b: bil. bulat

$10000 = 1 \times 10^4$ //

↔ $75000000 = 75 \times 10^6$

$= 7{,}5 \times 10^7$

Operasi

$(a \times 10^b) \times (c \times 10^d) = (a \times c) \times 10^{(b+d)}$

$\frac{12 \times 10^6}{4 \times 10^{-3}} = \frac{12}{4} \times 10^{6-(-3)}$

$= 3 \times 10^9$

$(a \times 10^b)^k = (a^k) \cdot (10^b)^k$

$= (2 \times 10^5)^2$

$= (2^2) \times 10^{5 \times 2}$

$= 4 \times 10^{10}$ //

Alfabet Yunani

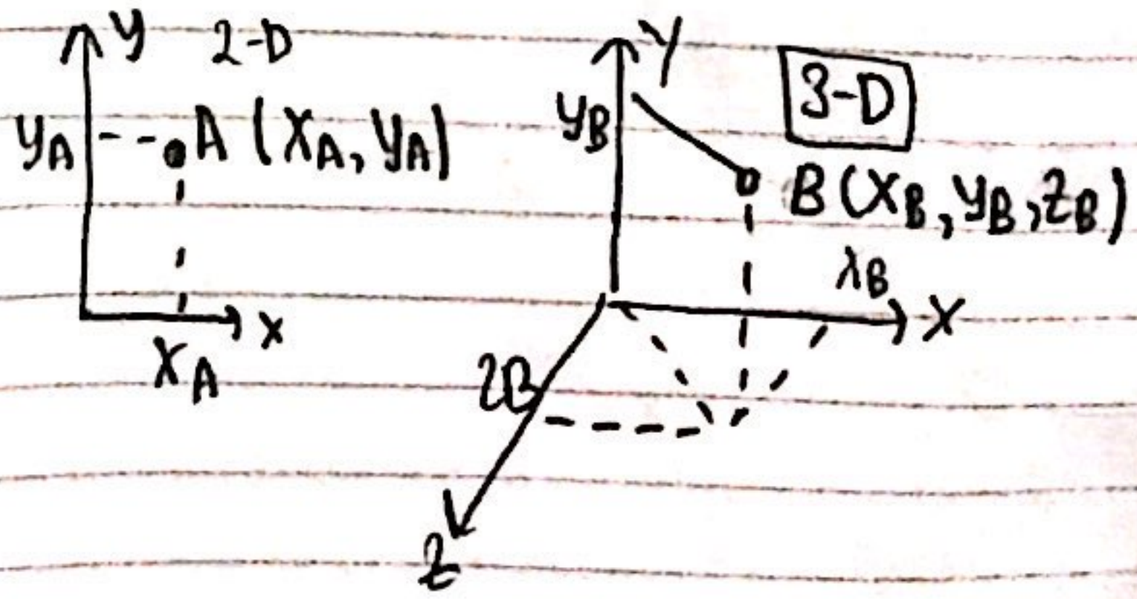
Aα Bβ Γγ Δδ Eε Zζ

Hη Θθ Iι Kκ Λλ Mμ

Nν Ξξ Oo Ππ Pρ Σσς

Tτ Yυ Φφ Xχ Ψψ Ωω

Sistem koordinat: cartesian



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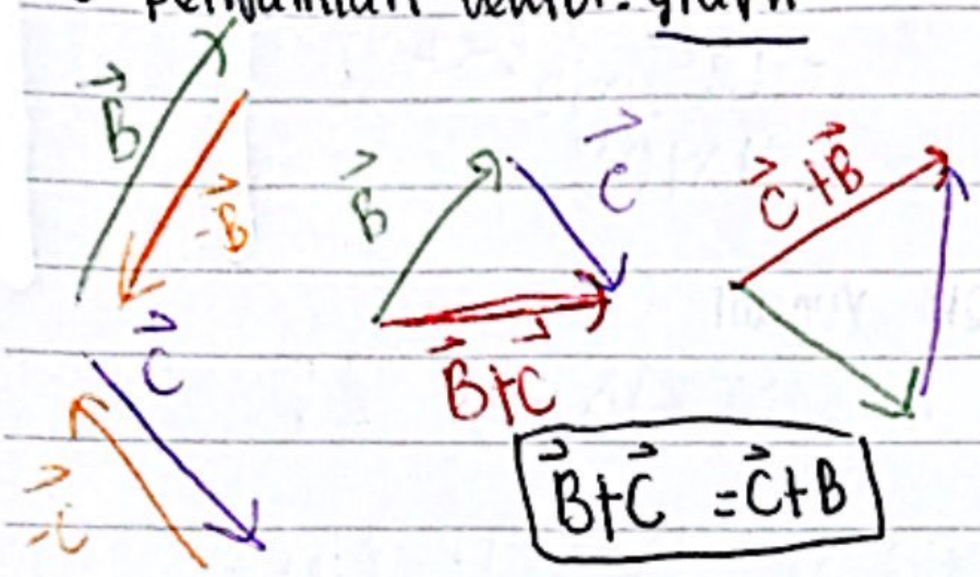
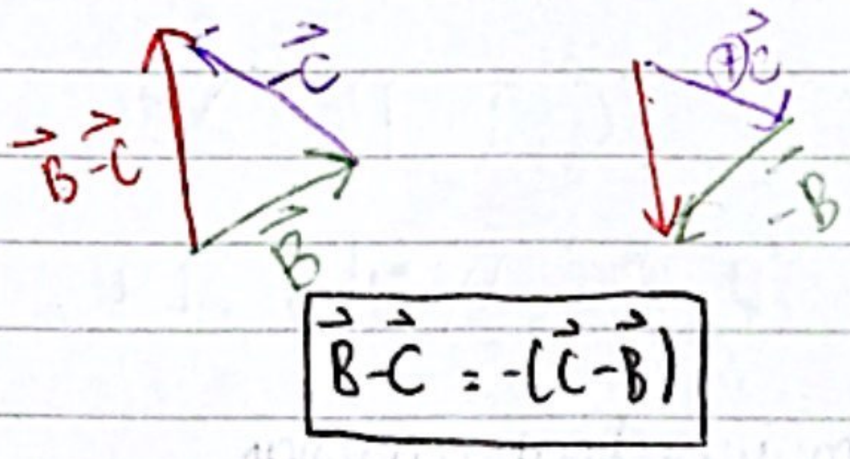
Pengali & awalan:

Faktor	awalan	simbol	Faktor	awalan
10^{24}	yotta	Y	10^{-24}	yotta-
10^{21}	zetta	Z	10^{-21}	zepto-
10^{18}	exsa-	E	10^{-18}	atto-
10^{15}	peta	P	10^{-15}	femto-
10^{12}	tera-	T	10^{-12}	piko-
10^{9}	giga-	G	10^{-9}	nano-
10^{6}	mega-	M	10^{-6}	micro-
10^{3}	kilo-	k	10^{-3}	milli-
10^{2}	hekto-	h	10^{-2}	senti-
10^{1}	deka-	da	10^{-1}	desi-

① Penjumlah vektor: grafik



$\vec{B}+\vec{C} = \vec{C}+\vec{B}$



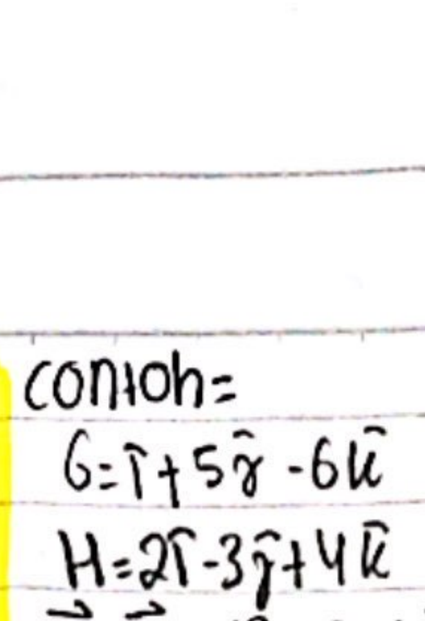
$\vec{B}-\vec{C} = -(\vec{C}-\vec{B})$

② Penjumlahan vektor: Analitis

Misal: $\vec{V} = 2\hat{i}$,
$\vec{W} = 7\hat{j}$
Tentukan: $\vec{V}+\vec{W}$
Jawaban:
salah: $\vec{V}+\vec{W} = 9$
$\vec{V}+\vec{W} = 9(\hat{i}+\hat{j})$
$\vec{V}+\vec{W} = 9\hat{i}\hat{j}$

$\vec{V}+\vec{W} = 2\hat{i}+7\hat{j}$

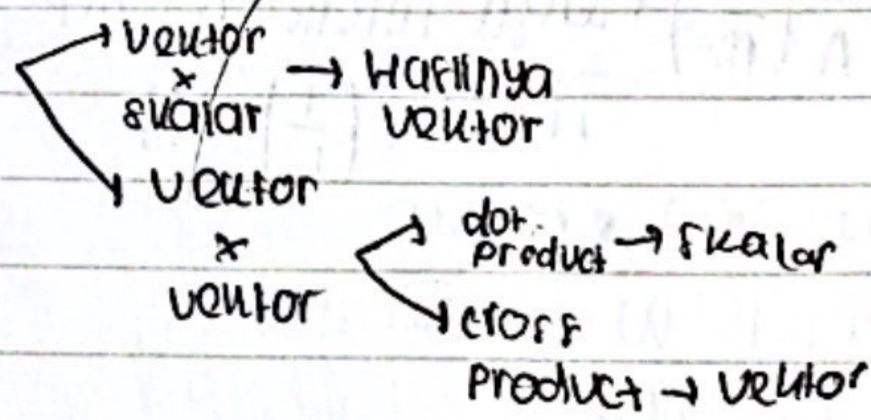
contoh=
$G = \hat{i}+5\hat{j}-6\hat{k}$
$H = 2\hat{i}-3\hat{j}+4\hat{k}$
$\vec{G}+\vec{H} = (\hat{i}+5\hat{j}-6\hat{k})+(2\hat{i}-3\hat{j}+4\hat{k})$
$= (1\hat{i}+2\hat{i})(5\hat{j}-3\hat{j})(-6\hat{k}+4\hat{k})$
$= (3\hat{i})(2\hat{j})(-2\hat{k})$



$\vec{A}+\vec{B}$ = Resultan vektor
$\vec{A}$ & $\vec{B} = \vec{R}$
$\vec{R} = \vec{A}+\vec{B}$
$(A_x\hat{i}+A_y\hat{j})+$
$(B_x\hat{i}+B_y\hat{j})$

Lakukan penjumlah u/komponen arah:-
$R_x = A_x+B_x$
$= A\cos\theta + (-B\cos\theta)$
$R_y = A_y+B_y$
$= A\sin\theta + (-B\sin\theta)$
$\therefore \vec{R} = R_x\hat{i}+R_y\hat{j}$

③ Perkalian vektor =



a. perkalian vektor dgn skalar
Co: $P = 2\hat{i}+10\hat{j}-6k$.
Hitung $(-\frac{1}{2})P$?
$(-\frac{1}{2})P = 2(-\frac{1}{2})i+10(-\frac{1}{2})j-6(-\frac{1}{2})k$
$= -\hat{i}+(-5\hat{j}+3k)$
$= -\hat{i}-5\hat{j}+3k$ //

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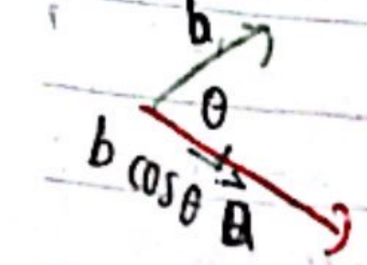
b. Perkalian titik (dot Product) "."

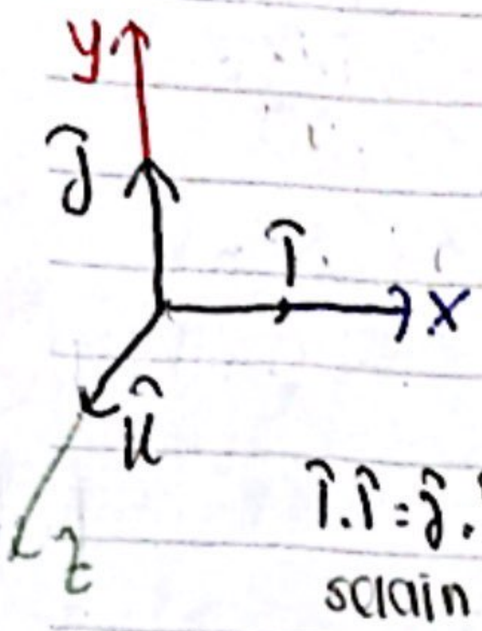


$\vec{a}.\vec{b} = ab\cos\theta$

hasilnya hanya berupa angka

$\hat{i}\perp\hat{j}\perp\hat{k}$ (saling tegak lurus, 90°)

$\cos 90° = 0$



$\hat{i}.\hat{i} = \hat{j}.\hat{j} = \hat{k}.\hat{k} = 1$

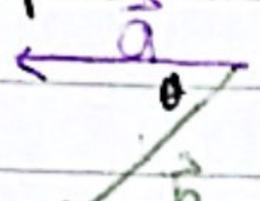
selain itu hasilnya 0

$\vec{a}.\vec{b} = (a_x\hat{i} + a_y\hat{j} + a_z\hat{k}).(b_x\hat{i} + b_y\hat{j} + b_z\hat{k})$

$\Leftrightarrow \vec{a}.\vec{b} = (a_x\hat{i}.b_x\hat{i}) + (a_y\hat{j}.b_y\hat{j}) + (a_z\hat{k} \times b_z\hat{k})$ (= 1 dik)

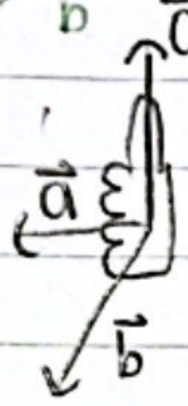
$\boxed{\vec{a}.\vec{b} = a_x.b_x + a_y.b_y + a_z.b_z}$

c. perkalian silang cross product "x"



$\boxed{a\times b = ab\sin\theta(\hat{a}\times\hat{b})}$

arah



$\Leftrightarrow \hat{i}\perp\hat{j}\perp\hat{k}$ (saling tegak lurus)

$\sin 90° = 1$

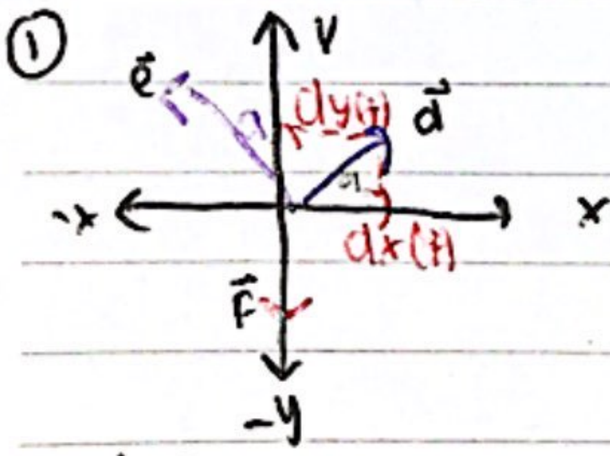
$\hat{i}\times\hat{i} = \hat{j}\times\hat{j} = \hat{k}\times\hat{k} = 0$

$\hat{k}\to\hat{i}$

$\hat{i}\to\hat{j}$

$\hat{j}\to\hat{k}$

latihan soal vektor

① 

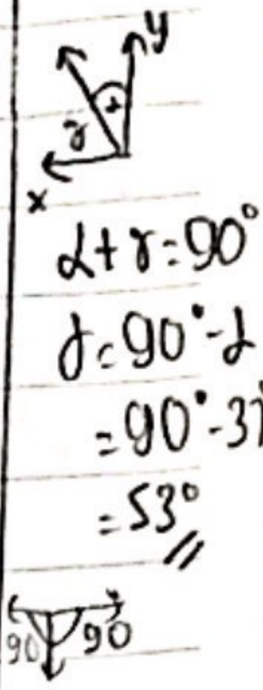
d=80, e=100, F=60

$\Leftrightarrow \sin 37, \cos 53 = 0{,}6$

$\cos 37, \sin 53 = 0{,}8$

$d = 37°$

vektor	komp x	komp y
$\vec{d}$	$dx = d\cos\alpha$ $= 80\cos 37$ $= 80\,(0{,}8)$ $= 64$	$dy = d\sin\alpha$ $= 80\sin 37$ $= 80\,(0{,}6)$ $= 48$
$\vec{e}$	$ex = e\cos\alpha$ $= 100\cos 53$ $= 100\,(0{,}6)$ $= 60$	$ey = e\sin\alpha$ $= 100\sin 53$ $= 100\,(0{,}8)$ $= 80$
$\vec{F}$	$Fx = F\cos 90°$ $= 0$	$Fy = F\sin 90°$ $= 60.(1)$ $= 60$
$\vec{R}$	$Rx = dx + ex + Fx$ $= 64 - 60 + 0$ $= 4\hat{i}$	$Ry = dy + ey + Fy$ $= 48 + 80 - 60$ $= 128 - 60$ $= 68\hat{j}$



$\therefore 4\hat{i} + 60\hat{j}$

② dua buah vektor sbb:

$\vec{a} = 4\hat{i} - \hat{j} + 2\hat{k}$

$\vec{b} = -\hat{i} + 3\hat{k}$

tentukan:

(a) $\vec{a}.\vec{b}$

$(4\hat{i} - \hat{j} + 2\hat{k}).(-\hat{i} + 3\hat{k})$

$= 4\hat{i}.-\hat{i} + 2\hat{k}.3\hat{k}$

$= -4\hat{i} + 6\hat{k} = -4 + 6 = 2$

(b) $\vec{a}\times\vec{b}$

$(4\hat{i} - \hat{j} + 2\hat{k}) \times (-\hat{i} + 3\hat{k})$

$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & -1 & 2 \\ -1 & 0 & 3 \end{vmatrix}$

$(4\hat{i}.-\hat{i}) + (4\hat{i}.3\hat{k}) + (-\hat{j}.-\hat{i}) + (-\hat{j}.3\hat{k}) + (2\hat{k}.-\hat{i}) + (2\hat{k}.3\hat{k})$

$= 0 + (-12\hat{j}) + (\hat{k}) + (-3\hat{i}) + (-2\hat{j}) + 0$

$= -12\hat{j} + \hat{k} - 3\hat{i} - 2\hat{j}$

$= -12\hat{j} - 2\hat{j} + \hat{k} - 3\hat{i}$

$= -14\hat{j} + \hat{k} - 3\hat{i}$ $\boxed{= -3\hat{i} - 14\hat{j} + \hat{k}}$

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c. suatu vektor c yg memenuhi

$\vec{a} - \vec{b} + \vec{c} = 0$

$\vec{c} = -\vec{a} + \vec{b}$

$= -(4\hat{i} - \hat{j} + 2\hat{k}) + (-\hat{i} + 3\hat{k})$

$= -4\hat{i} + \hat{j} - 2\hat{k} - \hat{i} + 3\hat{k}$

$= -4\hat{i} - \hat{i} + \hat{j} - 2\hat{k} + 3\hat{k}$

$= -5\hat{i} + \hat{j} - \hat{k}$ //

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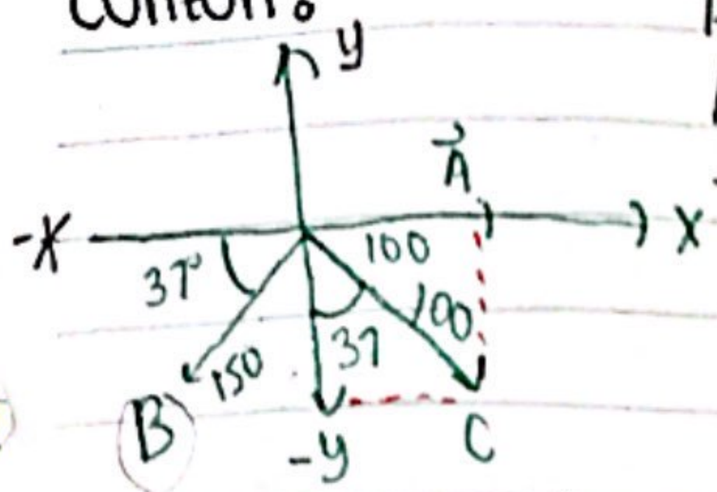
Vektor

Besaran vektor:

- Besar
- arah

} dideskripsikan melalui panah

Contoh:



$A_x = A\cos\theta$
$A_y = A\sin\theta$
$-B_x = -B\sin\theta$
$B_y = B\cos\theta$

Vektor	komp x	komp y
$\vec{A}$	$A_x = A\cos 0$ $= 100.1 = 100$	$A_y = A\sin 0°$ $= 100.0 = 0$
$\vec{B}$	$-B_x = -B(\cos$	$-B_y = -B\sin 37°$
$\vec{C}$	$C_x = C\sin$	$-C_y = -C\cos 37°$

$\cos 37 = 4/5$

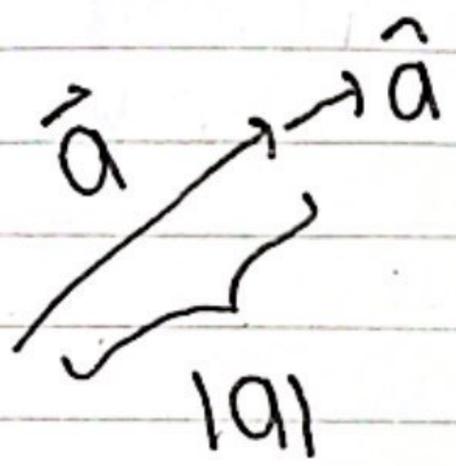
$\sin 37 = 3/5$

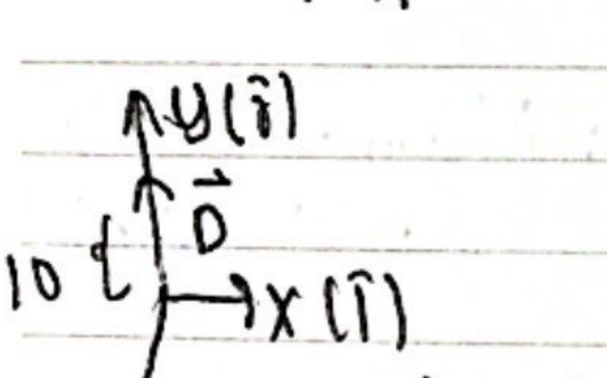
Penulisan vektor

$\vec{a} = |a|\hat{a}$

vektor → arah

↓ besar





$\vec{D} = 10\hat{j}$

Penjumlah vektor

$\vec{A} = 5\hat{i}$

$\vec{B} = -2\hat{i}$

$\vec{C} = 3\hat{j}$

$\vec{D} = -\hat{j}$

$\vec{A} + \vec{B} = 5\hat{i} + (-2\hat{i}) = 3\hat{i}$

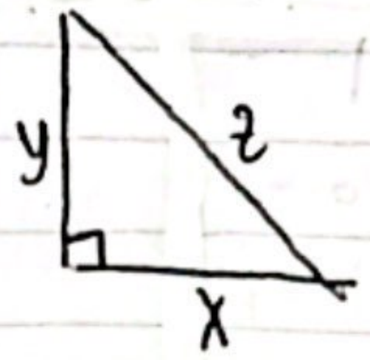
$\vec{E} = \vec{A} + \vec{C} = 5\hat{i} + 3\hat{j}$

$\vec{F} = B - \vec{D} = -2\hat{i} - (-\hat{j})$

$\vec{E} + \vec{F} = (5\hat{i} + 3\hat{j}) + (-2\hat{i} + \hat{j})$

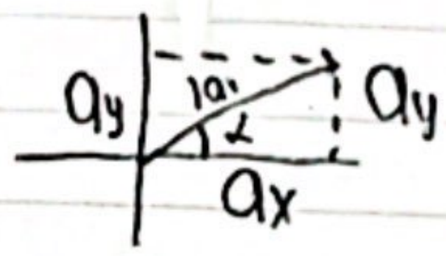
$\vec{E} + \vec{F} = 3\hat{i} + 4\hat{j}$

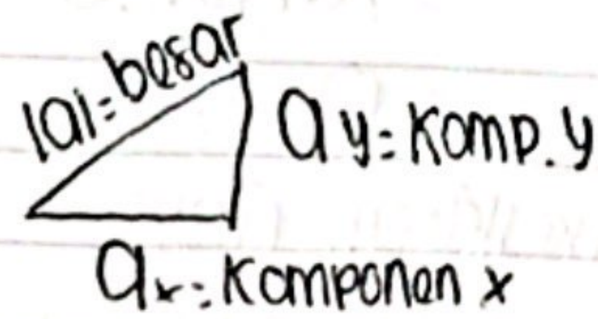
Berapa besar vektor $\vec{E} + \vec{F}$?



$x^2 + y^2 = z^2$

$z = \sqrt{x^2 + y^2}$

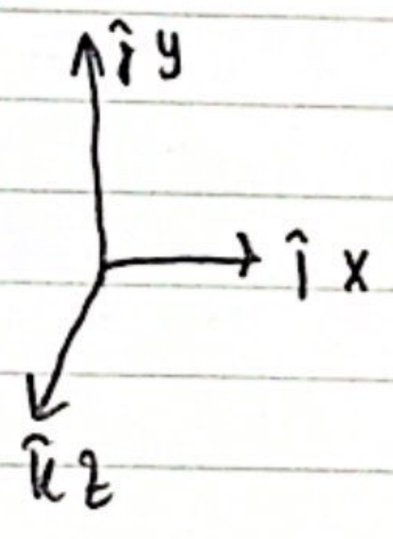




Perkalian dot

$\vec{A} \cdot \vec{B} =$ 1 skalar

$\vec{A} \cdot \vec{B} = |A||B|\cos\theta$



$\hat{i}\cdot\hat{i} = \hat{j}\cdot\hat{j} = \hat{k}\cdot\hat{k} = 1$

$\hat{i}\cdot\hat{j} = \hat{i}\cdot\hat{k} = \hat{k}\cdot\hat{j} = 0$

$a\hat{i} \cdot b\hat{j} = |a||b|\cos 0$

$= |a||b| \cdot 1 = |a||b|\cos\theta$

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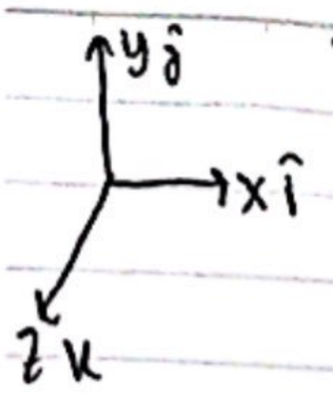

$\hat{i}.\hat{i} = \hat{j}.\hat{j} = \hat{k}.\hat{k} = 1$

$\hat{i}.\hat{j} = \hat{i}.\hat{k} = \hat{k}.\hat{j} = 0$

$(6\hat{i}+3\hat{j})(5\hat{i}-2\hat{j})$

$= (40\hat{i} + (-0) + 0 + (-6\hat{j}))$

$= 40\hat{i} - 6\hat{j}$

$= 40.1 - 6.1 = 34$

$a\hat{i}.b\hat{i} = |a||b| \cos 0$

$= |a||b|.1 = |a|.|b|$

$a\hat{i}.b\hat{j} = |a||b| \cos 90°$

$= |a||b|.0$

$= 0$

Perkalian cross =

$|A \times B| = |A||B| \sin\theta$

$\vec{A} \times \vec{B}$ = vektor

$\hat{i} \times \hat{j} = k$

$\hat{j} \times \hat{i} = -k$

$k \times \hat{i} = \hat{j}$

$\hat{i} \times \hat{i} = 0$

$\hat{j} \times \hat{j} = 0$

$\hat{k} \times \hat{k} = 0$

$\vec{A} = (\hat{i} + 2\hat{j})$

$\vec{B} = (3\hat{i} - 4\hat{j})$

$\vec{A} \times \vec{B} = (\hat{i} + 2\hat{j}) \times (3\hat{i} - 4\hat{j})$

$= (\hat{i} \times 3\hat{i}) + (\hat{i} \times -4\hat{j}) + (2\hat{j} \times 3\hat{i}) +$
$(2\hat{j} \times -4\hat{j})$

$= -4\hat{k} - 6\hat{k} = -10\hat{k}$ //