الكهربائية والمغناطيسية

الموضوع : التاريخ ٧ / ١١ / ٢٠١٩

1. المتجهات Vectors
2. الكهربائية الساكنة Electrostatic
3. قانون كولوم Coulumb's law
4. المجال الكهربائي Electric field
5. الفيض الكهربائي وقانون كاوس electric flux
6. الجهد الكهربائي electric Potential ~~بالدفع~~
7. المتسعات Capacitors
8. التيار والمقاومة Current Resistance
9. دوائر التيار المستمر Direct current
10. المغناطيسية

الكميات

- متجهة Vector (قيمة واتجاه)
- عددية Scalar (قيمة)

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الكميات الفيزيائية

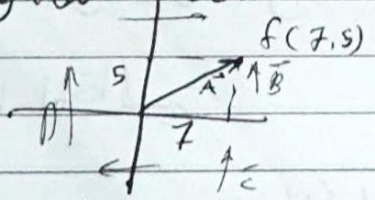
- أولية: هي كتلة، مسافة، زمن
- مشتقة من الأولية: السرعة، التعجيل
- تكميلية: زاوية

- عددية Scalar: فيها magnitude
- متجهات Vector: فيها اتجاه + قيمة = direction + magnitude

① الاحداثيات الكارتيزية

Rectangular Coord.

ex:-

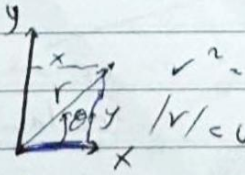


X, y : 2D

X, y, Z : 3D

Polar Coord.

② الاحداثيات القطبية



$r^2 = x^2 + y^2$

$|r| = \sqrt{x^2 + y^2}$

$\sin\theta = \frac{y}{r}$

$\cos\theta = \frac{x}{r}$

$\tan\theta = \frac{y}{x}$

$x = r\cos\theta$

$y = r\sin\theta$

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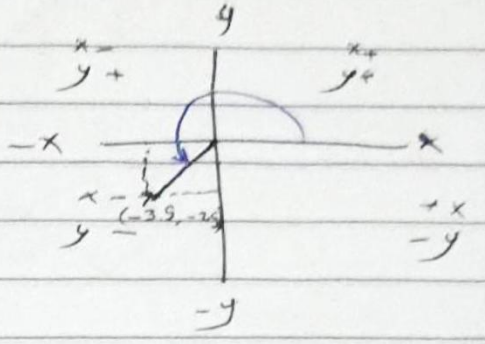
Example: If the vector Coordinate of a vector are $(x,y) = (-3.5, -2.5)$

Find his polar coordinate r, θ



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

$$= \sqrt{(-3.5)^2 + (-2.5)^2}$$

$$= 4.3 \text{ m}$$

$$\tan\theta = \frac{y}{x} = \frac{-2.5}{-3.5} = 0.714$$

$$\theta = \tan^{-1}(0.714) = 216^\circ$$

Ex. Find the Value of the vector (r) and it's direction (θ) ; if $X = 3m$ and $y = 4m$

$$r = \sqrt{x^2 + y^2} = \sqrt{9 + 16} = \sqrt{25}$$

$$\boxed{5 \text{ m}}$$

$$\tan\theta = \frac{y}{x} = \frac{4}{3} = 1.33$$

$$\tan^{-1} 1.3 = \boxed{53.13^\circ}$$

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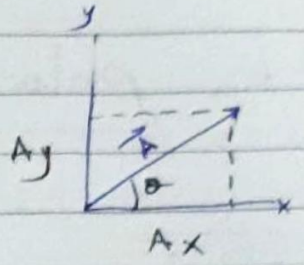
متجه Vector $\bar{A} = A_x(i) + A_y(j) + A_z(k)$

وحدة المتجه 1 — مركبة 1 — اتجاه x

وحدة المتجه 1 — مركبة 1 — اتجاه y

وحدة المتجه 1 — اتجاه z



$A_x = A\cos\theta$

$A_y = A\sin\theta$

$A = \sqrt{A_x^2 + A_y^2}$, $\theta = \tan^{-1}\frac{A_y}{A_x}$

Vector Unit :- وحدة المتجه

هو متجه مقياسه المطلق واحد، وهذا يتغير عند ضرب أي مركبة متجه، لكنه يدل على اتجاهها ويستخدم لكتابة معادلة المتجهات

Vector Unit :- is a vector whose absolute value is one that doesn't change the amount of any component of the vector but indicates the direction and is used to write

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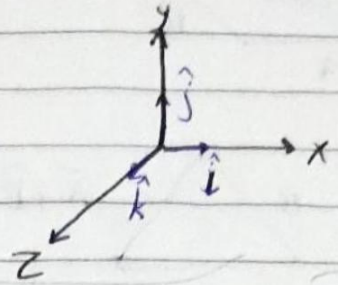
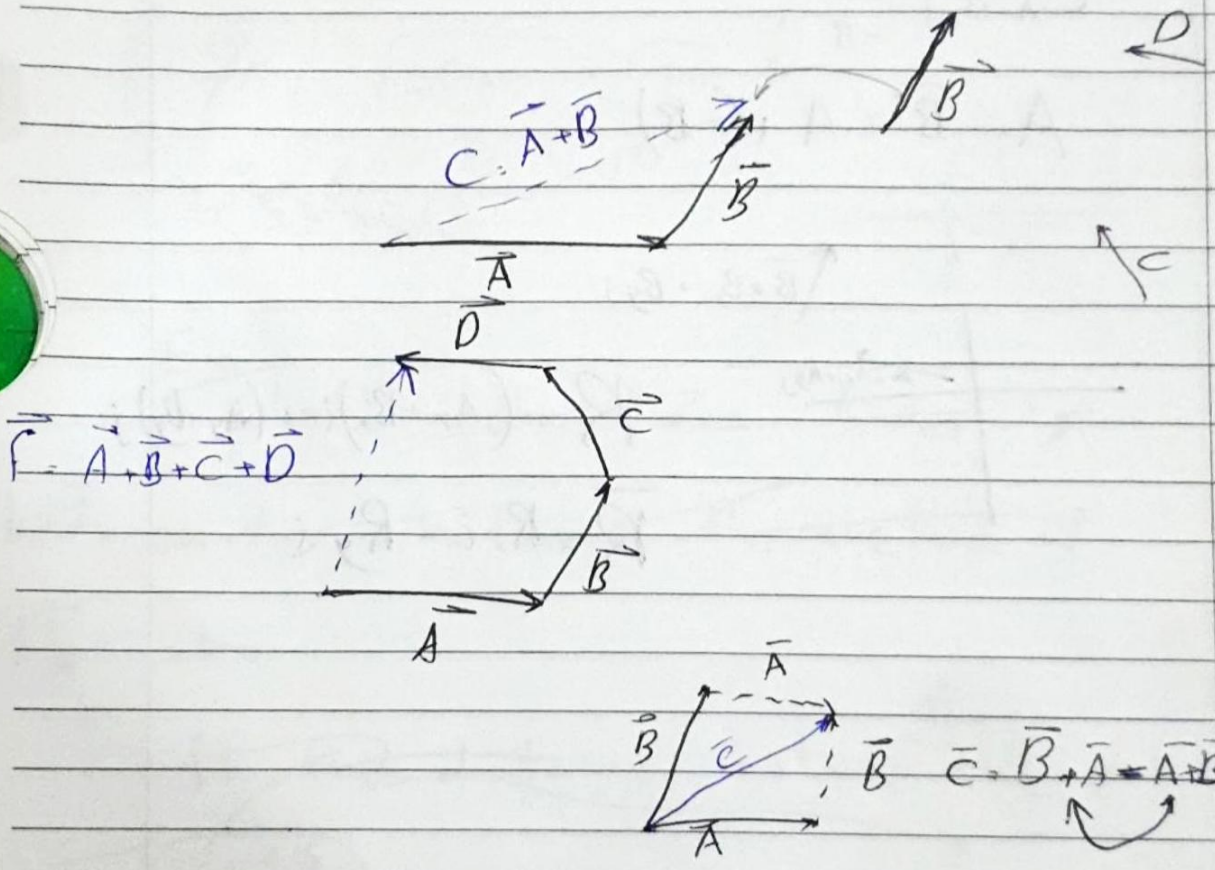
the equation of vectors as follows

$$\vec{A} = A_x \hat{i} + A_y \hat{j} + A_z \hat{k}$$



Vectors Algebra



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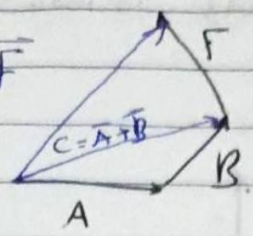
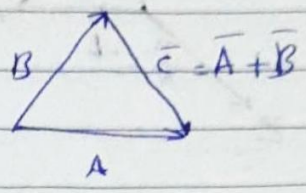
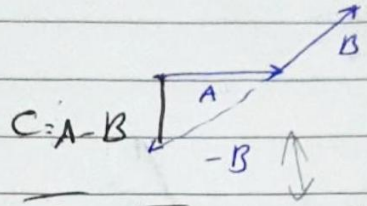
$\bar{D} = (\bar{A} + \bar{B}) + \bar{F}$



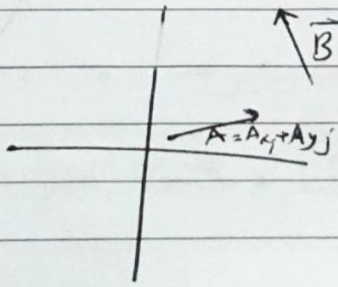
الطريقة ٢





$$\bar{A} - \bar{B} = A + (-B)$$

الجمع الجبري للمتجهات



$$\bar{R} = (A_x + B_x)i + (A_y + B_y)j$$

$$\bar{R} = R_x i + R_y j$$

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ex: find the sum of 2 vectors

$\bar{A} = 3i + 4j$

$\bar{B} = 2i - 5j$

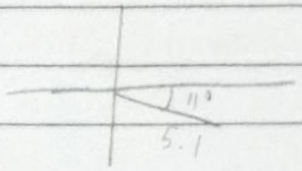
$\bar{R} = (A_x + B_x) + (A_y + B_y)$

$= (3+2)i + (4-5)j$

$\vec{R} = 5i - j$

$|\bar{R}| = \sqrt{25+1} = \sqrt{26}$

$\theta = \tan^{-1}\frac{R_y}{R_x} = -11°$



Ex

what is the force of repulsion between two protons in the nucluse of Fe atom.

If the distance between the protons in 4×10^{-15} m?

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التاريخ / / ٢٠١

الموضوع :

Find the sum of the Vector

$\overline{A} = 2i + 2j$

$\overline{B} = 2i - 4j$

$\overline{R} = 4i - 2j$

$|\overline{R}| = \sqrt{16+4} = \sqrt{20}$

$\theta = \tan^{-1}\frac{y}{x} = \frac{-2}{4} = \frac{-1}{2} = -26.56$

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التاريخ / / ٢٠١

الموضوع :

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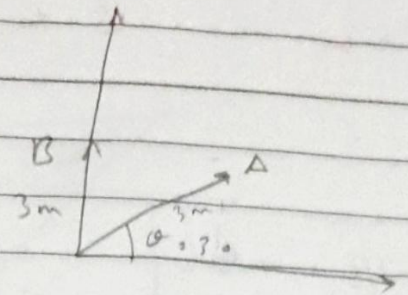

$\overline{A}_x = A\cos\theta$

$= 3(0.866) = 2.5m$

$A_y = A\sin\theta = 3\left(\frac{1}{2}\right) = \frac{3}{2} = 1.5m$

$A = 2.5i + 1.5j$

$B = 0i + 3j$

$\overline{R} = 2.5i + 4.5j$

$|\overline{R}| = \sqrt{6.25 + 20.25} = \sqrt{26.5} = 5.14\,m$

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التاريخ / / ٢٠١

Ex $\bar{A} = 3i + 2j$ $\bar{B} = -i - 4j$

Find:

a) $\bar{A} + \bar{B} = \boxed{2i - 6j}$

b) $\bar{A} - \bar{B} = \boxed{4i + 2j}$

c) $|\bar{A} + \bar{B}| = \sqrt{4 + 36} = \sqrt{40} \approx 6.32$

d) $|\bar{A} - \bar{B}| = \sqrt{16 + 4} = \sqrt{20} \approx 4.47$

e) the direction of $\bar{A} + \bar{B}$ and $|\bar{A} - \bar{B}|$

$\bar{A} + \bar{B} \Rightarrow \tan^{-1}\frac{y}{x} = \frac{-6}{2} = -3 \Rightarrow \tan^{-1}(3) = \boxed{-71.56}$

$|\bar{A} - \bar{B}| \Rightarrow \tan^{-1}\frac{y}{x} = \frac{2}{4} = \frac{1}{2} \Rightarrow \tan^{-1}\left(\frac{1}{2}\right) = \boxed{26.56^\circ}$

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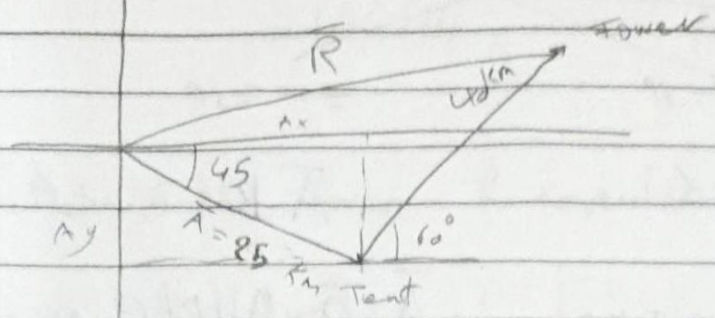

Find $\bar{R}$

$A_x = A\cos\theta = 85\cos 315 = 17.67$

$A_y = A\sin\theta = 85\sin 315 = -17.67$

$B_x = B\cos\theta = 40\cos 60 = 20$

$B_y = B\sin\theta = 40\sin 60 = 34.64$

$\therefore \bar{A} = 17.67i - 17.67j$

$\bar{B} = 20 + 34.64j$

$\therefore \bar{R} = 37.67i + 16.97j$

$|\bar{R}| = \sqrt{x^2+y^2} = \sqrt{1419 + 282.1} = \boxed{41.24\ m}$

$\tan\theta = \frac{16.97}{37.67} = \boxed{24.25^\circ}$

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الموضوع : التاريخ / / ٢٠١

Product of Vectors

ضرب اتجاهي — ضرب عددي

$\bar{A} \times \bar{B}$ ⇒ كمية اتجاهية — $\bar{A} \cdot \bar{B}$ ⇒ كمية عددية

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

$+ve \Leftarrow 0 < \theta < 90$

$-ve \Leftarrow 90 < \theta < 180$

$Zero \Leftarrow 90 = \theta$

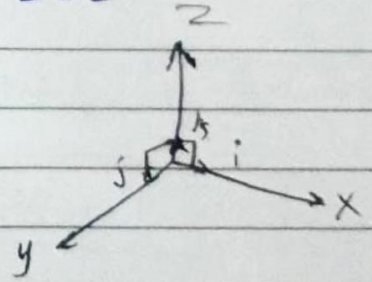
$$\bar{A} = A_x i + A_y j + A_z k$$

$$\bar{B} = B_x i + B_y j + B_z k$$

$$\bar{A} \cdot \bar{B} = (A_x i + A_y j + A_z k)(B_x i + B_y j + B_z k)$$

$$= A_x B_x + A_y B_y + A_z B_z$$

$i \cdot i = 1$
$j \cdot j = 1$
$k \cdot k = 1$



$\cos\theta = 0$
$\theta = 90$
$i \cdot j = 0$
$j \cdot k = 0$
$k \cdot j = 0$

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$$\cos\theta = \frac{\bar{A}\cdot\bar{B}}{|A||B|} = \frac{A_x B_x + A_y B_y + A_z B_z}{|A||B|}$$