n 1 2 ... n

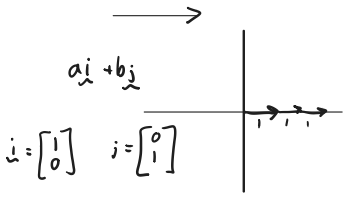
n+1 objects ⇒ at least 1 hole has ≥2 objects

mn+1 objects ⇒ at least 1 hole has at least m+1

$\begin{bmatrix} a \\ b \end{bmatrix}$

$a\underset{\sim}{i} + b\underset{\sim}{j}$

$\underset{\sim}{i}$ ⟨ magnitude, direction



$\begin{bmatrix} a \\ b \end{bmatrix}$

$a\underset{\sim}{i} + b\underset{\sim}{j} = a\begin{bmatrix}1\\0\end{bmatrix} + b\begin{bmatrix}0\\1\end{bmatrix} = \begin{bmatrix} a \\ b \end{bmatrix}$

$\begin{bmatrix} 3 \\ 2 \end{bmatrix} = k\begin{bmatrix} a \\ 5 \end{bmatrix}$

$a \cdot b = |a||b|$

$a = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

$b = \begin{bmatrix} 4 \\ n \end{bmatrix}$

$a \parallel b$

$\begin{bmatrix} 3 \\ 2 \end{bmatrix} = k\begin{bmatrix} 4 \\ n \end{bmatrix}$

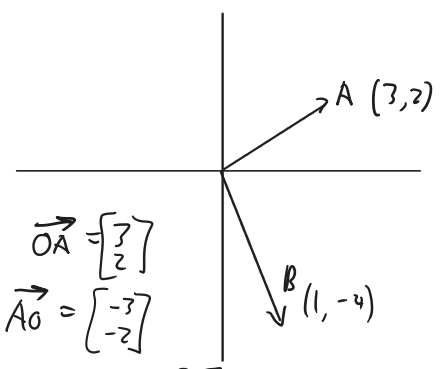
$3 = 4k$

$2 = kn$

$k = \frac{3}{4}$

$2 = \frac{3}{4}n$

$n = \frac{8}{3}$



$\overrightarrow{OA} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

$\overrightarrow{AO} = \begin{bmatrix} -3 \\ -2 \end{bmatrix}$

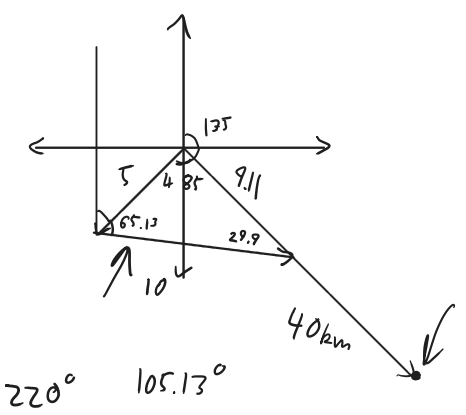
$\overrightarrow{AB} = \begin{bmatrix} -3 \\ -2 \end{bmatrix} + \begin{bmatrix} 1 \\ -4 \end{bmatrix} = \begin{bmatrix} -2 \\ -6 \end{bmatrix}$

$A \cdot B = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$

Bob want to go 135°

5 km h⁻¹ current at 220°

Bob's boat goes at 10 km⁻¹



$\frac{\sin(65.13)}{x} = \frac{\sin(85)}{10}$

$x = 9.11$

$c = \sqrt{5^2 + 10^2 - 2 \cdot 10 \cdot 5\cos(65.13)}$

4.39 hour

1. $\hat{a}$ if $a = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$

0.8575
0.5145

Action → vector
→ unitV

unitV$\left(\begin{bmatrix} 5 \\ 3 \end{bmatrix}\right)$

2. $\left|\begin{bmatrix} a \\ 3 \end{bmatrix} + \begin{bmatrix} 2 \\ b \end{bmatrix}\right|$

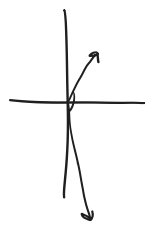
Action → vector
→ norm

$\text{norm}\left(\begin{bmatrix} a+2 \\ b+3 \end{bmatrix}\right) = \sqrt{a^2+b^2+4a+6b+13}$

3. ∠COA

$\overrightarrow{OC} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$

$\overrightarrow{OA} = \begin{bmatrix} 3 \\ -7 \end{bmatrix}$



Action → vector
→ angle

$\text{angle}\left(\begin{bmatrix} 3 \\ 5 \end{bmatrix}, \begin{bmatrix} 3 \\ -7 \end{bmatrix}\right)$

$= 125.84°$

4. $\begin{bmatrix} 2 \\ 285 \end{bmatrix} \cdot \begin{bmatrix} 13k \\ 137 \end{bmatrix}$

$= 26k + 39045$

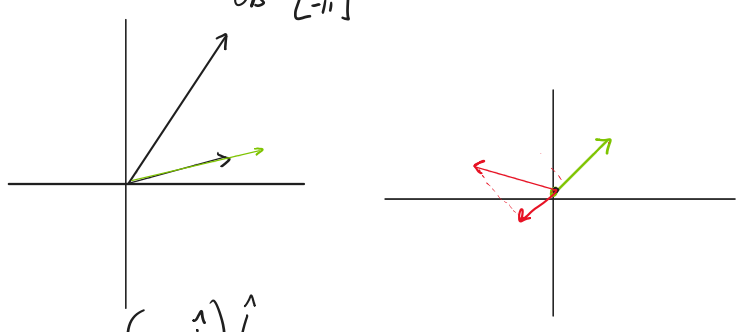
5. Projection of OA onto OB

$\overrightarrow{OA} = \begin{bmatrix} 3 \\ 8 \end{bmatrix}$

$\overrightarrow{OB} = \begin{bmatrix} 9 \\ -11 \end{bmatrix}$

$\text{proj}_B(A) = \frac{a \cdot b}{|b|^2} \cdot b$

$= (a \cdot \hat{b})\hat{b}$



$(a \cdot \hat{b})\hat{b}$

$\left(\begin{bmatrix} 3 \\ 8 \end{bmatrix} \cdot \hat{\begin{bmatrix} 9 \\ -11 \end{bmatrix}}\right)\hat{\begin{bmatrix} 9 \\ -11 \end{bmatrix}}$ ⟶ $\text{dotP}\left(\begin{bmatrix} 3 \\ 8 \end{bmatrix}, \text{unitV}\left(\begin{bmatrix} 9 \\ -11 \end{bmatrix}\right) \times \text{unitV}\left(\begin{bmatrix} 9 \\ -11 \end{bmatrix}\right)\right)$

$= \begin{bmatrix} -2.72 \\ 3.32 \end{bmatrix}$

${}^5P_2$ → nPr(5, 2)

nPr(n, r)

nCr(n, r)

Keyboard → Math1

→ solve(

solve(<equation>, variable)

solve(5x = 12)

$x = \frac{12}{5}$

$5x = 12$

$\therefore x = \frac{12}{5}$

$\sin(x) + 0.7\cos(x) = 0.9$

$\therefore x =$

$\Rightarrow x = \frac{12}{5}$

$\begin{bmatrix} 5 \\ 4 \end{bmatrix} = k\begin{bmatrix} 6 \\ x \end{bmatrix}$

$5 = k6$

$\therefore k = \frac{5}{6}$

$4 = kx$

$= \frac{5}{6}x$

$\therefore x = \frac{24}{5}$