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PHYS - 230 LAB

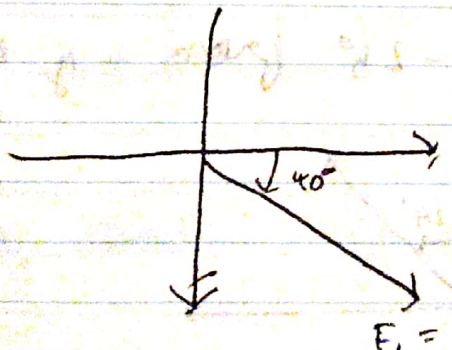
QUIZ #3

Consider the following four forces :-

$F_1 = 300.00\ N$, $-40°$ from $+x$ axis
$F_2 = 430.00\ N$, $+60°$ from $+y$ axis
$F_3 = 500.00\ N$, $+35°$ from $-x$ axis
$F_4 = 250.00\ N$, $-25°$ from $+y$ axis

Determine the resultant force (magnitude & direction)

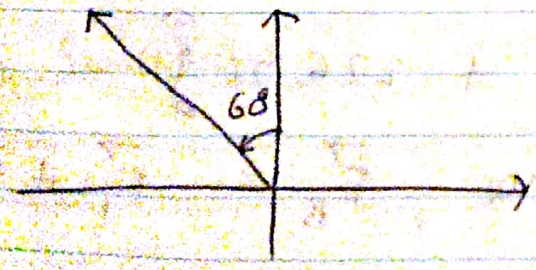
Ans:- Given $\vec{F_1} = 300\ N$, $-40°$ from $+x$-axis.



$= 300 \cos 40° \hat{i} + 300 \sin 40° (-\hat{j})$

$= 229.8 \hat{i} + 192.84 (-\hat{j})$.

$\vec{F_2} = 430\ N$, $+60°$ from $+y$-axis



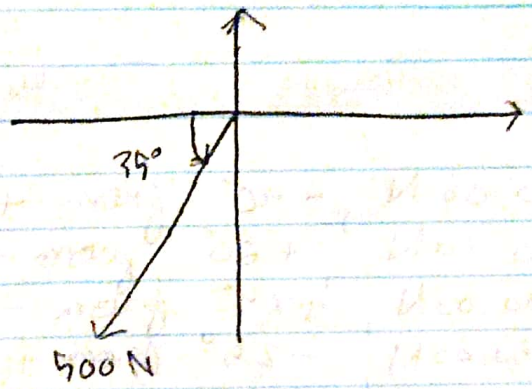
$\Rightarrow 430 \cos 60° \hat{j} + 430 \sin 60° (-\hat{i})$

$\Rightarrow 215 \hat{j} + 372.39 (-\hat{i})$

P.T.O

$\vec{F}_3$ = 500N , +35° from −x axis.

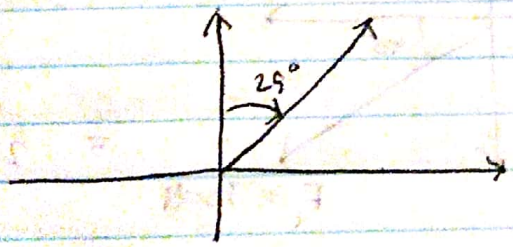
=



$= 500 \cos 35°(-\hat{i}) + 500 \sin 35°(-\hat{j})$

$= 409.58(-\hat{i}) + 286.79(-\hat{j})$

$\vec{F}_4$ = 250N , −25° from +y axis



$= 250 \cos 25°(\hat{j}) + 250 \sin 25°(\hat{i})$

$= 105.65\hat{i} + 226.58\hat{j}$

Resultant force , $\vec{F}_R = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$

$\vec{F}_R = 229.8\hat{i} + 192.84(-\hat{j}) + 372.4(-\hat{i}) + 215\hat{j} +$

$409.58(-\hat{i}) + 286.79(-\hat{j}) + 105.65(\hat{i})$

$+ 226.58\hat{j}$

$= 446.43(-\hat{i}) + 38.05(-\hat{j})$

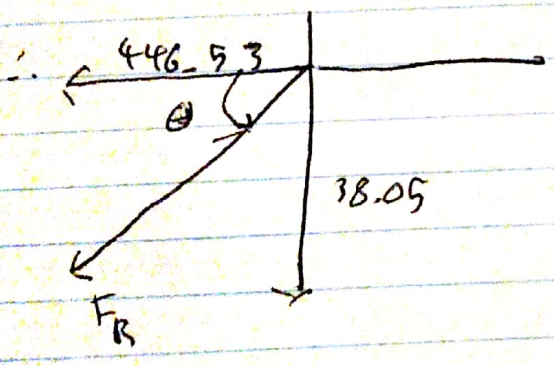
P.T.O

Magnitude of resultant force, $|\vec{F_R}| = \sqrt{(446.53)^2 + (38.05)^2}$

$|\vec{F_R}| = \sqrt{199389.04 + 1447.8}$

$= \sqrt{200836.84}$

$= 448.15\ N$



Here, $\tan\theta = \frac{38.05}{446.53} = 0.0852$

$\theta = 4.87°$

The direction is $-4.87°$ from $-x$-axis.