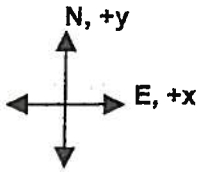
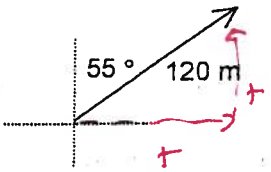
SPH4U *COMPONENT ANALYSIS FOR VECTOR ADDITION AND SUBTRACTION*

1.a) Find the x and y components of each displacement vector shown below using the given coordinate axes.



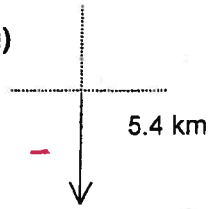
i)



Δd_x= 120 m cos 35° = 98.3m

Δd_y= 120m sin 35° = 68.8m

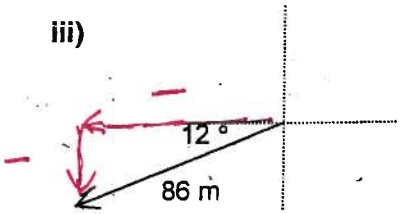
ii)



Δd_x= 0

Δd_y= −5.4 km

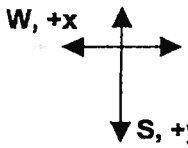
iii)



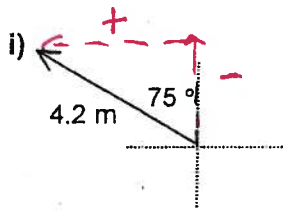
Δd_x= 86m cos 12° = −84.1m

Δd_y= −86m sin 12° = −17.9m

b) Find the x and y components of each displacement vector shown below using the given coordinate axes.



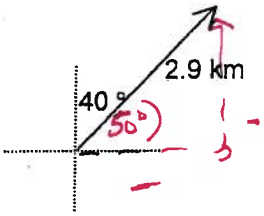
i)



Δd_x= 4.2m sin 75° = 4.06m

Δd_y= −4.2m cos 75° = −1.09m

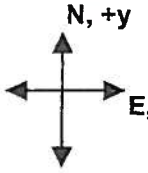
ii)



Δd_x= −2.9 km cos 50° = −1.86 km

Δd_y= −2.9 km sin 50° = −2.22 km

2. Perform the following vector operations using component analysis. Recombine the components of the resultant to express the resultant in magnitude and direction form. Use the x/y coordinate axes shown below for your analysis.



a) Δd_1= 85.0 km [36° W of N] , Δd_2= 122.0 km [15° S of W], $\Delta d_R = \Delta d_1 + \Delta d_2$ = ?

$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x}$

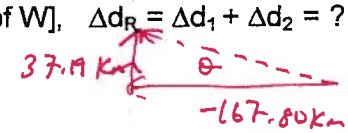
$= -85.0 \sin 36° - 122.0 \cos 15°$

$= -167.80$ km

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y}$

$= 85.0 \cos 36 - 122.0 \sin 15°$

$= 37.19$ km

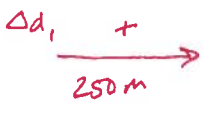


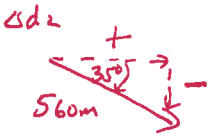
$\Delta d_R = \sqrt{(167.80)^2 + (37.19)^2} = 171.87$ km

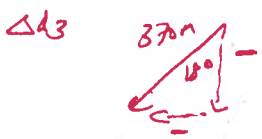
$\theta = \tan^{-1}\left(\frac{37.19}{167.80}\right) = 12.5°$

$\vec{\Delta d_R}$ = 172 km [12.5° N of W]

b) Δd_1= 250 m [E], Δd_2= 560 m [35° S of E], Δd_3= 370 m [18° W of S], $\Delta d_R = \Delta d_1 + \Delta d_2 + \Delta d_3$ =?







$\Delta d_{Rx} = \Delta d_{1x} + \Delta d_{2x} + \Delta d_{3x}$

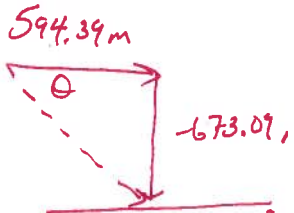
$= 250 + 560 \cos 35 - 370 \sin 18$

$= 594.39$ km

$\Delta d_{Ry} = \Delta d_{1y} + \Delta d_{2y} + \Delta d_{3y}$

$= 0 - 560 \sin 35 - 370 \cos 18$

$= -673.09$ km



$\Delta d_R = \sqrt{594.39^2 + 673.09^2}$

$= 898$ m

$\theta = \tan^{-1}\left(\frac{673.09}{\quad}\right) = 49°$

$\vec{\Delta d_R}$ = 898m [° of]