Q1) Tension in the cable AB, $T_{AB} = 1425N$

Determine the components and magnitude of the vector $\vec{BA}$, measuring from B towards the origin. Denoting by i, j, k the unit vectors along the coordinate axes, we write

$$\vec{BA} = (-900\ mm)\,i + (600\ mm)\,j + (360\ mm)\,k.$$

magnitude of $\vec{BA} = \sqrt{(-900\ mm)^2 + (600\ mm)^2 + (360\ mm)^2}$
$= 1140\ mm$

$\lambda_{BA} = \frac{\vec{BA}}{BA}$, as the unit vector along BA. Then,

$$T_{BA} = T_{BA}\frac{\vec{BA}}{BA}$$

Substitude the values of T_{BA}, $\vec{BA}$ and BA

$$T_{BA} = \frac{1425\ N}{1140\ mm}\left[(-900\ mm)\,i + (600\ mm)\,j + (360\ mm)\,k\right]$$
$$= (-1125N)\,i + (750N)\,j + (450N)\,k$$

$\boxed{(T_{BA})_x = -1125}$ $\boxed{(T_{BA})_y = 750N}$ $\boxed{(T_{BA})_z = 450N}$

2 a) $(\cos\theta_x)^2 + (\cos\theta_y)^2 + (\cos\theta_z)^2 = 1$

$(\cos 75°)^2 + (\cos\theta_y)^2 + (\cos 130°)^2 = 1$ $\qquad \cos\theta_y = \mp 0,72$

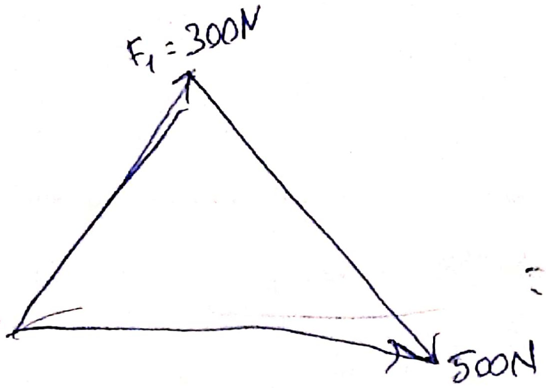
Since $F_y > 0$, we choose $= +0{,}72$ $\boxed{\theta_y = 41{,}25°}$

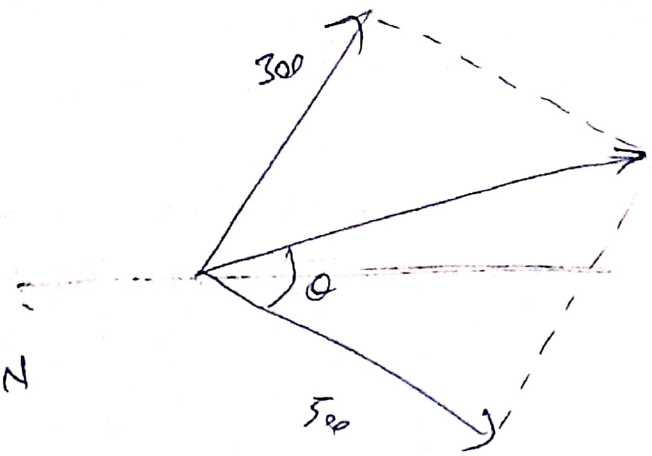
$$\cos\theta_y = \frac{F_y}{F} = \frac{300}{F} = 0.72 \rightarrow F = 416{,}6\ lb$$

$$F_x = F \times \cos\theta_x = 416{,}6 \times \cos 75° = 107{,}82\ lb$$

$$F_z = F \times \cos\theta_z = 416{,}6 \times \cos 130° = -267{,}78\ lb$$

Q3





$R = \sqrt{R_x^2 + R_y^2}$

$F_{1z} = 300 \times \sin 60 = 259.80$

$F_{1y} = 300 \times \sin 30 \times \cos 45 = 106{,}06$

$F_{1x} = 300 \times \cos 60 \times \sin 45° = 106{,}06$

$F_{2z} = 500 . \cos 120 = -250$

$F_{2y} = 500 . \cos 45° = 353{,}55$

$F_{2x} = 500 . \cos\theta = 353{,}55$

$\theta_x = 45°$

$F_{Rz} = 9.80 \quad F_{Ry} = \overset{459{,}61}{\cancel{247{,}49}} \quad F_{Rx} = 459{,}61$

$F_R = \sqrt{(9{,}80)^2 + (459{,}61)^2 + (459{,}61)^2}$

$\boxed{= 650{,}06\ N}$

$650{,}06^2 = 300^2 + 500^2 - 2 \times 300 \times 500 \times \cos\theta$

$\overset{0{,}27}{\cancel{10{,}586}} = \cos\theta$

$\boxed{105{,}96° = \theta}$