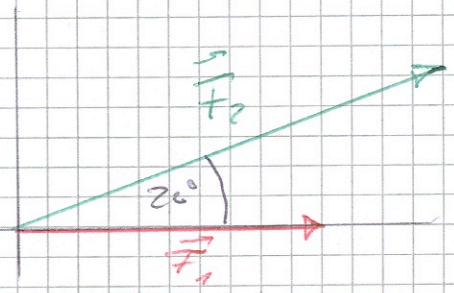
Polarkoordinaten
TBM 5A, 29.11.13

(1) $F_1 = 200N$, $F_2 = 300N$, $\sphericalangle(\vec{F}_1, \vec{F}_2) = 20°$

$$\vec{F}_1 = (200N, 0°) = \begin{pmatrix} 200 \\ 0 \end{pmatrix} N$$

$$\vec{F}_2 = (300N, 20°) = 300 \begin{pmatrix} \cos 20° \\ \sin 20° \end{pmatrix}$$



$$\vec{F}_1 + \vec{F}_2 = \begin{pmatrix} 481.908 \\ 102.606 \end{pmatrix}$$

$$|\vec{F}_1 + \vec{F}_2| = 492.71N$$

$$\alpha = \arctan\left(\frac{102.606}{481.908}\right) = 12.02°$$

$$\vec{F}_{Res} = (492.17N, 12.02°)$$

Winkel: $\sphericalangle(\vec{F}_1, \vec{F}_{Res}) = 12.02°$

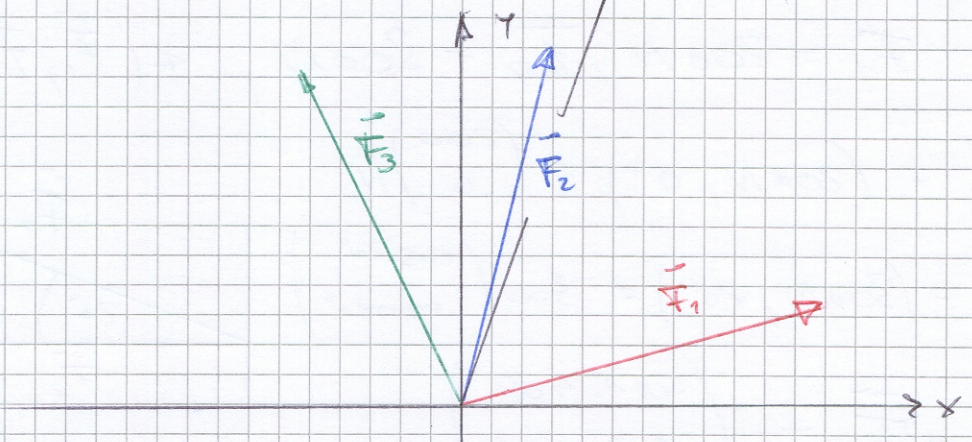
$\sphericalangle(\vec{F}_{Res}, \vec{F}_2) = 7.98°$

(2)

$$\vec{F}_1 = (50N, 15°) = 50N \cdot \begin{pmatrix} \cos 15° \\ \sin 15° \end{pmatrix}$$

$$\vec{F}_2 = (50N, 75°) = 50N \begin{pmatrix} \cos 75° \\ \sin 75° \end{pmatrix}$$

$$\vec{F}_3 = (50N, 115°) = 50 \begin{pmatrix} \cos 115° \\ \sin 115° \end{pmatrix}$$



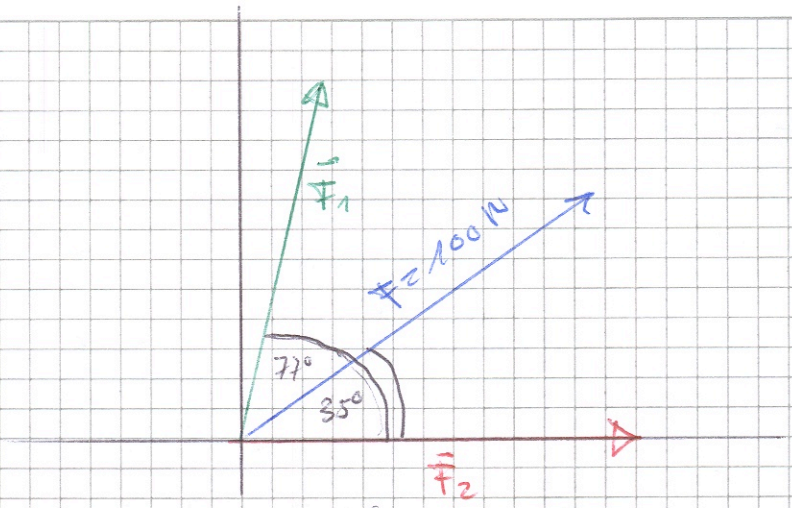
$$\vec{F}_1 + \vec{F}_2 + \vec{F}_3 = \begin{pmatrix} 40.106 \\ 106.553 \end{pmatrix} N = \vec{F}_{Res}$$

$$F_{Res} = 113.851N$$

$$\alpha = \arctan\left(\frac{106.553}{40.106}\right) = 69.374°$$

$$\vec{F}_{Res} = (113.851N, 69.374°)$$

(3)



$$\vec{F}_1 = (F_1, 77°) = F_1 \cdot \begin{pmatrix} \cos 77° \\ \sin 77° \end{pmatrix} \quad - v_1$$

$$\vec{F}_2 = (F_2, 0°) = F_2 \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad - v_2$$

$$\vec{F} = (100, 35°) = 100 \cdot \begin{pmatrix} \cos 35 \\ \sin 35 \end{pmatrix} \quad - v$$

$$100 \begin{pmatrix} \cos 35 \\ \sin 35 \end{pmatrix} = F_1 \begin{pmatrix} \cos 77 \\ \sin 77 \end{pmatrix} + F_2 \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$F_1 = 58.866\,N$$

$$F_2 = 68.673\,N$$

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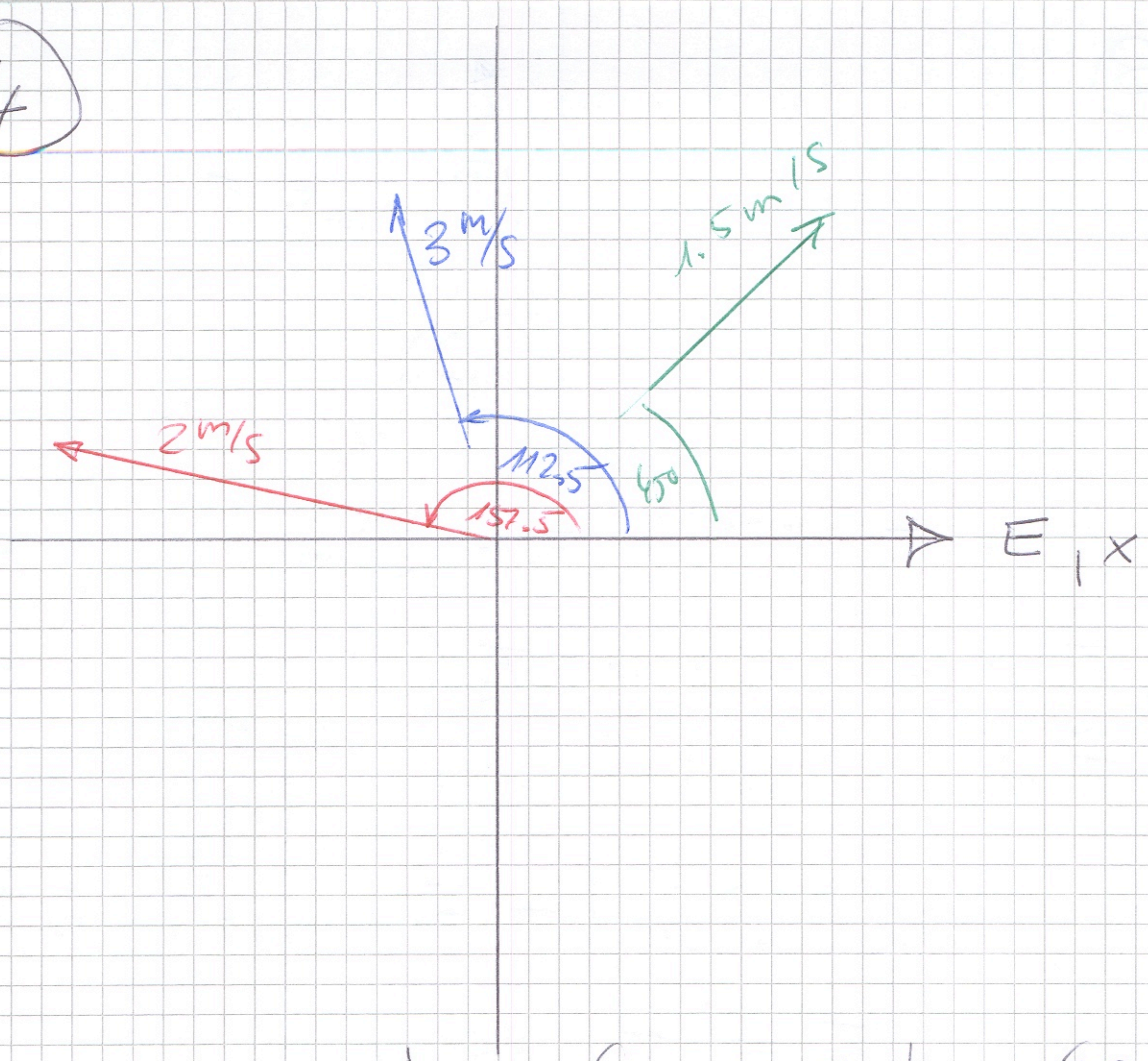

$$1.5\begin{pmatrix}\cos 45^\circ \\ \sin 45\end{pmatrix} + 3\begin{pmatrix}\cos(112.5) \\ \sin(112.5)\end{pmatrix} + 2\begin{pmatrix}\cos 157.5 \\ \sin 157.5\end{pmatrix}$$

$$\vec{v} = \begin{pmatrix}-1.935 \\ 4.598\end{pmatrix} \text{ m/s}$$

$$v = 4.988 \text{ m/s}$$

$$\varphi = -67.174^\circ \longrightarrow 112.826^\circ$$

$$337.174^\circ$$