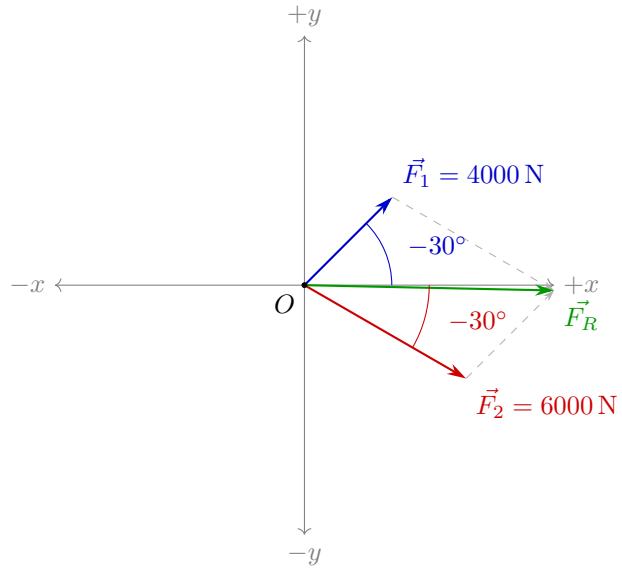


Engineering Calculation Report: Problem 2-6

Generated: 2025-12-09

Problem Setup

Vector	$ \vec{F} $ (N)	θ (deg)	Ref
\vec{F}_1	4000.0	-30.0	+v
\vec{F}_2	6000.0	-30.0	+u
\vec{F}_R	?	?	+u



Equations Used

$$(1) |\vec{F}_R|^2 = |\vec{F}_1|^2 + |\vec{F}_2|^2 - 2 \cdot |\vec{F}_1| \cdot |\vec{F}_2| \cdot \cos(\angle(\vec{F}_1, \vec{F}_2))$$

$$(2) \frac{\sin(\angle(\vec{F}_1, \vec{F}_R))}{|\vec{F}_2|} = \frac{\sin(\angle(\vec{F}_1, \vec{F}_2))}{|\vec{F}_R|}$$

Solution

Step 1: $\angle(\vec{F}_1, \vec{F}_2)$

$$\angle(\vec{F}_1, \vec{F}_2) = |\angle(\vec{v}, \vec{F}_1)| + |\angle(\vec{u}, \vec{F}_2)| = |(-30^\circ)| + |(-30^\circ)| = 30^\circ + 30^\circ = 105^\circ$$

Step 2: $|\vec{F}_R|$ using Eq 1

$$|\vec{F}_R| = \sqrt{(4000.0 \text{ N})^2 + (6000.0 \text{ N})^2 - 2(4000.0 \text{ N})(6000.0 \text{ N})\cos(105.0^\circ)} = 8026.4 \text{ N}$$

Step 3: $\angle(\vec{F}_1, \vec{F}_R)$ using Eq 2

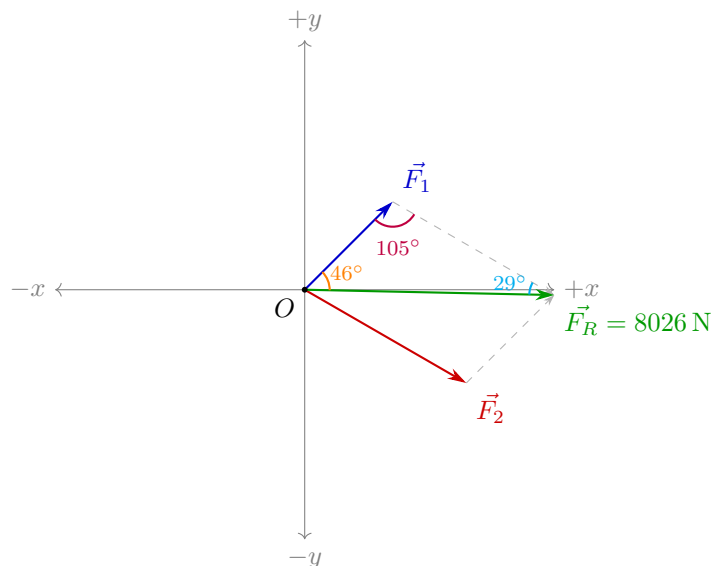
$$\angle(\vec{F}_1, \vec{F}_R) = \sin^{-1}(6000.0 \text{ N} \cdot \frac{\sin(105.0^\circ)}{8026.4 \text{ N}}) = 46.2^\circ$$

Step 4: $\angle(\vec{u}, \vec{F}_R)$ with respect to +u

$$\angle(\vec{u}, \vec{F}_R) = \angle(\vec{u}, \vec{F}_1) - \angle(\vec{F}_1, \vec{F}_R) = 45.0^\circ - 46.2^\circ = -1.2^\circ$$

Results

Vector	$ \vec{F} $ (N)	θ (deg)	Ref
\vec{F}_R	8026.4	-1.2	+u



Signatures: Calc. By: _____ Rev. By: _____ Appr. By: _____

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