Engineering Calculation Report: DynamicProblem

November 26, 2025

1 Known Variables

Vector	F_x (N)	F_y (N)	$|\vec{F}|$ (N)	θ (deg)	Reference
$\vec{F_1}$	225.0	389.7	450.0	60.0	+x
$\vec{F_2}$	-676.1	-181.2	700.0	15.0	-x

2 Unknown Variables

Vector	F_x (N)	F_y (N)	$|\vec{F}|$ (N)	θ (deg)	Reference
$\vec{F_R}$	?	?	?	?	+x

3 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. $\dfrac{\sin(\angle(\vec{F_1}, \vec{F_R}))}{|\vec{F_2}|} = \dfrac{\sin(\angle(\vec{F_1}, \vec{F_2}))}{|\vec{F_R}|}$

4 Step-by-Step Solution

Step 1: Solve for $\angle(\vec{F_1}, \vec{F_2})$

$$\begin{aligned}
\angle(\vec{F_1}, \vec{F_2}) &= |\theta_{F_1} - \theta_{F_2}| \\
&= |60° - 15°| \\
&= 45°
\end{aligned}$$

Step 2: Solve for $|\vec{F_R}|$ using Eq 1

$$\begin{aligned}
|\vec{F_R}| &= \sqrt{(450.0)^2 + (700.0)^2 + 2(450.0)(700.0)\cos(45°)} \\
&= 497.0N
\end{aligned}$$

Step 3: Solve for $\angle(\vec{F_1}, \vec{F_R})$ using Eq 2

$$\angle(\vec{F_1}, \vec{F_R}) = \sin^{-1}(700.0 \cdot \frac{\sin(45°)}{497.0})$$
$$= 95.2°$$

Step 4: Solve for θ_{F_R} with respect to +x

$$\theta_{F_R} = \theta_{F_1} + \angle(\vec{F_1}, \vec{F_R})$$
$$= 60.0° + 95.2°$$
$$= 155.2°$$

5   Summary of Results

Vector	F_x (N)	F_y (N)	$|\vec{F}|$ (N)	θ (deg)	Reference
$\vec{F_R}$	-451.1	208.5	497.0	155.2	+x

Disclaimer

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