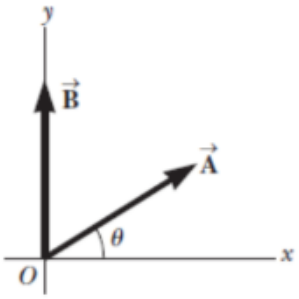
Answer on Question #81062 - Physics - Mechanics – Relativity

Question

Use the component method to add the vectors vector A and vector B shown in the figure. The length of vector B is 2.90 m and the angle θ = 31.5°. Express the resultant vector A + vector B in unit-vector notation.
vector A + vector B =

Solution

Seems like the figure must be like this:



To apply the component method of vector addition, we can use Pythagorean theorem (only B and θ are given):

$$|R| = \sqrt{(A\cos\theta)^2 + B^2} = \sqrt{(A\cos\theta)^2 + 2.90^2} = \sqrt{0.727 \cdot A^2 + 8.41}.$$

Express the resultant vector R in unit-vector form:

$$\vec{R} = \frac{R\cos\alpha}{R} i + \frac{R\sin\alpha}{R} j = \cos\alpha \cdot i + \sin\alpha \cdot j,$$

where α – the angle between R and X axis,

$$\alpha = \frac{A\cos\theta}{R} = \frac{0.85A}{\sqrt{0.727 \cdot A^2 + 8.41}}.$$

Thus,

$$\vec{R} = \cos\frac{0.85A}{\sqrt{0.727 \cdot A^2 + 8.41}} \cdot \boldsymbol{i} + \sin\frac{0.85A}{\sqrt{0.727 \cdot A^2 + 8.41}} \cdot \boldsymbol{j}$$

Just substitute A for its value.

Answer

$$|R| = \sqrt{0.727 \cdot A^2 + 8.41},$$

$$\vec{R} = \cos\frac{0.85A}{\sqrt{0.727 \cdot A^2 + 8.41}} \cdot \boldsymbol{i} + \sin\frac{0.85A}{\sqrt{0.727 \cdot A^2 + 8.41}} \cdot \boldsymbol{j}$$

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