

Vectors

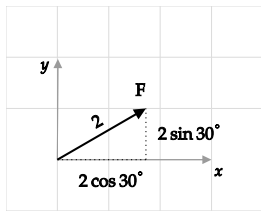
1 Problem I

A vector $\vec{\mathbf{F}}$ has a magnitude of 2 and makes an angle of 30° with the x -axis (with positive rotation counterclockwise).

1. Draw $\vec{\mathbf{F}}$.
2. Write $\vec{\mathbf{F}}$ in the form $F_x \hat{\mathbf{i}} + F_y \hat{\mathbf{j}}$.

Solution

1.



2. $\vec{\mathbf{F}} = 2 \cos(30^\circ) \hat{\mathbf{i}} + 2 \sin(30^\circ) \hat{\mathbf{j}} = \sqrt{3} \hat{\mathbf{i}} + \hat{\mathbf{j}}$, where $\cos(30^\circ) = \sqrt{3}/2$ and $\sin(30^\circ) = 1/2$ was used in the last step.

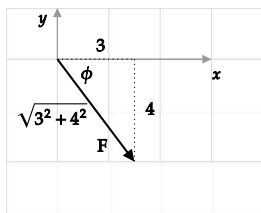
2 Problem II

Given $\vec{\mathbf{F}} = 3\hat{\mathbf{i}} - 4\hat{\mathbf{j}}$,

1. Draw $\vec{\mathbf{F}}$.
2. Compute F .
3. The angle $\vec{\mathbf{F}}$ makes with respect to the x -axis (with positive rotation counterclockwise).

Solution

1.



2. $F = \sqrt{3^2 + 4^2} = 5$
3. $\theta = 360^\circ - \phi = 360^\circ - \frac{180}{\pi} \tan^{-1}(4/3) \simeq 307^\circ$

