1.2.23 Matgeo

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Question

Represent graphically a displacement of 40 km, 30° west of south.

Coordinate System

We choose the coordinate axes such that:

- $+x$ axis $\rightarrow$ East
- $+y$ axis $\rightarrow$ North

Solution

The given displacement has magnitude

$$|\vec{D}| = 40 \text{ km}$$

and direction 30° west of south.

$$\theta = 270^\circ - 30^\circ = 240^\circ.$$

Vector Components

The vector components are:

$$D_x = 40\cos 240^\circ = -20,$$

$$D_y = 40\sin 240^\circ = -20\sqrt{3}.$$

Therefore,

$$\vec{D} = -20\hat{i} - 20\sqrt{3}\hat{j}.$$

Graphical Representation

The displacement vector is drawn from $(0, 0)$ to:

$$(-20,\ -20\sqrt{3}).$$