

Physics 108.002

Test 1

Sep. 12, 2002

Name _____

Grade _____

1. Find the x- and y-components of a 50 m displacement at an angle of 198° .

Theory

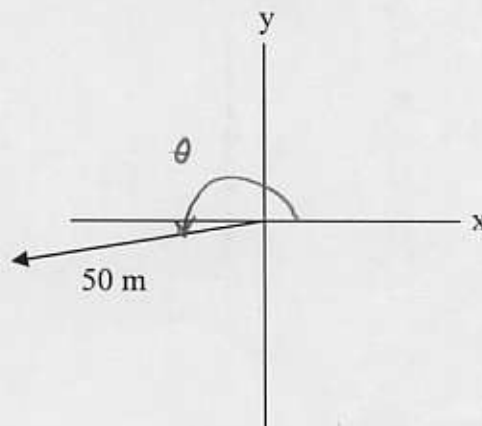
$$D = 50 \text{ m}$$

$$\theta = 198^\circ$$

$$D_x = D \cos \theta$$

$$D_y = D \sin \theta$$

Figure



Calculation

$$D_x = 50 \text{ m} \cos 198^\circ = -47.6 \text{ m}$$

$$D_y = 50 \text{ m} \sin 198^\circ = -15.45 \text{ m}$$

Answers

-47.6 m

-15.45 m

2. Find the magnitude and angle of \vec{R} if $\vec{R} = 50\hat{i} - 50\hat{j}$.

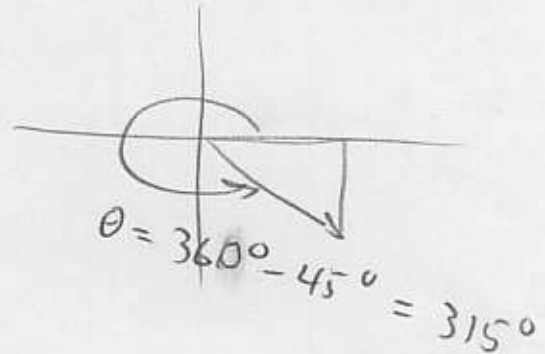
Theory

$$\vec{R} = 50\hat{i} - 50\hat{j} = R_x\hat{i} + R_y\hat{j}$$

$$R = \sqrt{R_x^2 + R_y^2}$$

$$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right)$$

Figure



Calculation

$$R = \sqrt{(50)^2 + (-50)^2} = 70.7$$

$$\theta = \tan^{-1}\left(\frac{-50}{50}\right) = 315^\circ$$

Answers

$$\frac{70.7}{315^\circ}$$

3. A ship is traveling due east at 20 km/h. What must be the speed of a second ship heading 40° north of east if it is always due north of the first ship?

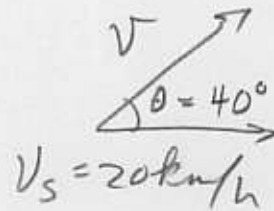
Theory

$$V \cos \theta = V_s$$

$$V \cos \theta = 20 \text{ km/h}$$

$$V = \frac{V_s}{\cos \theta}$$

Figure



Calculation

$$V = \frac{20 \text{ km/h}}{\cos 40^\circ} = 26.1 \text{ km/h}$$

Answer

26.1 km/h