

# Homework 1

Physics III, Fall 09

Problems: 3-20, 21, 22, 24

**3-20**

Let: N/S =  $y$ -axis and E/W =  $x$ -axis

$$\text{So: } dx = 2dy, \quad d_1 = 8, \quad d_2 = 3$$

$$\vec{d} = (d_1 dx \hat{i} + d_2 dy \hat{j})$$

a) Total distance is:

$$d_T = d_1 dx + d_2 dy$$

$$= 8dx + 3dy$$

$$= 8dx + 3 \cdot 2 \cdot dx$$

$$d_T = 14dx \text{ or } 14 \text{ E/W blocks}$$

$$\text{b) } |\vec{d}| = \left( (8dx)^2 + (3dy)^2 \right)^{1/2}$$

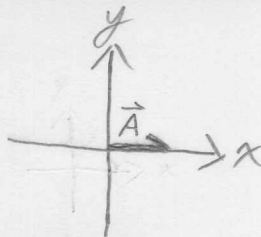
$$= \left( (8dx)^2 + (3 \cdot 2 \cdot dx)^2 \right)^{1/2}$$

$$= (64 + 36)^{1/2} dx$$

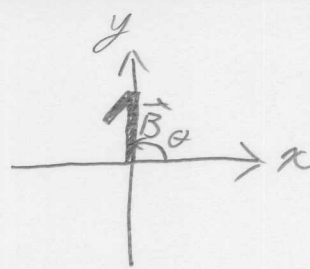
$$|\vec{d}| = 10dx \text{ or } 10 \text{ E/W blocks}$$

3-21

$$|\vec{A}| = 3.0\text{m}, \theta_A = 0$$



$$|\vec{B}| = 4.0\text{m}, \theta_B = 90^\circ$$



Find  $\vec{C}$  so that  $\vec{A} + \vec{B} + \vec{C} = 0$

$$\vec{A} = (3.0\text{m}\hat{x} + 0\text{m}\hat{y})$$

$$\vec{B} = (0\text{m}\hat{x} + 4.0\text{m}\hat{y})$$

$$A_x + B_x = -C_x$$

$$3.0 + 0 = -C_x$$

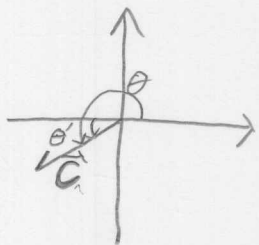
$$\boxed{C_x = -3.0}$$

$$A_y + B_y = -C_y$$

$$0 + 4.0 = -C_y$$

$$\boxed{C_y = -4.0}$$

$$\boxed{|\vec{C}| = (9 + 16)^{1/2} = 5.0\text{m}}$$

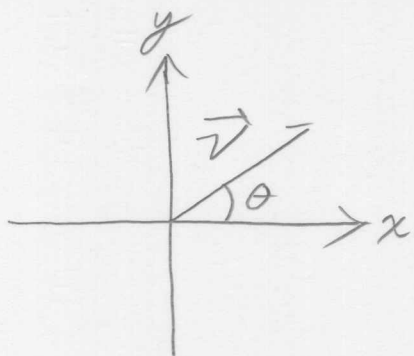


$$\theta' = \tan^{-1}\left(\frac{4}{3}\right) = 53^\circ$$

$$\theta = 180 + \theta'$$

$$\boxed{\theta = 180 + 53^\circ = 233^\circ}$$

3-22



$$|\vec{v}| = 120 \text{ km}$$

$$\theta = 29^\circ$$

$$\vec{v} = (|\vec{v}| \cos \theta \hat{x} + |\vec{v}| \sin \theta \hat{y})$$

$$= ((120) \cos 29^\circ \hat{x} + (120) \sin 29^\circ \hat{y})$$

$$\vec{v} = (105 \hat{x} + 58.2 \hat{y})$$

3-24

$$\vec{A} = (1\hat{x} + 1\hat{y})$$

$$|\vec{A}| = (1^2 + 1^2)^{1/2} = \sqrt{2}$$

$$\theta = \tan^{-1}(1) = 45^\circ$$