Homework 1
Physics III, Fall 09
Problems: 3-20, 21, 22, 24

3-20

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

So: $d_x = 2d_y$, $d_1 = 8$, $d_2 = 3$

$$\vec{d} = (d_1 \cdot d_x \hat{x} + d_2 \cdot d_y \hat{y})$$

a) Total distance is:

$$d_T = d_1 \cdot d_x + d_2 \cdot d_y$$

$$= 8d_x + 3d_y$$

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

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

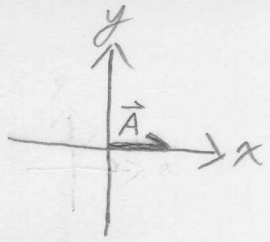
b) $$|\vec{d}| = \left((8 \cdot d_x)^2 + (3 \cdot d_y)^2\right)^{1/2}$$

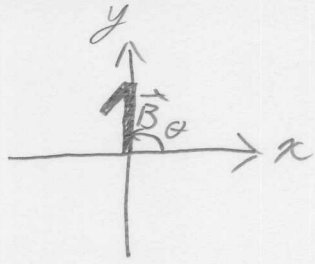
$$= \left((8 \cdot d_x^2) + (3 \cdot 2 \cdot d_x)^2\right)^{1/2}$$

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

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

3-21





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

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

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

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

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

$A_x + B_x = -C_x$

$3.0 + 0 = -C_x$

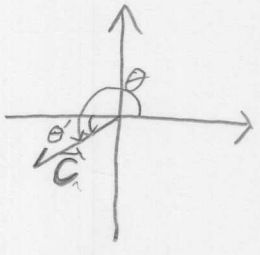
$\boxed{C_x = -3.0}$

$A_y + B_y = -C_y$

$0 + 4.0 = -C_y$

$\boxed{C_y = -4.0}$

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



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

$\theta = 180 + \theta'$

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

Physics 111
Homework

3-49

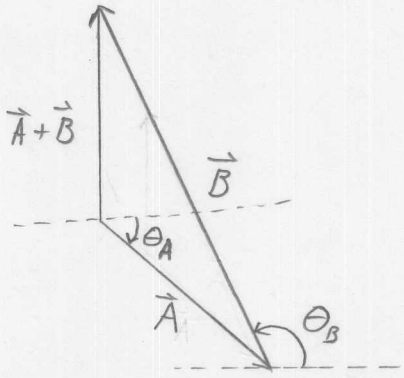
$|\vec{A}| = 1.0\,m$ $\quad |\vec{B}| = 1.8\,m$ $\quad \vec{A} + \vec{B} = 0\hat{x} + Y\hat{y}$

$\theta_A = -35°$ $\quad \theta_B = ?$

2 equations:

$x: |\vec{A}|\cos\theta_A + |\vec{B}|\cos\theta_B = 0$

$y: |\vec{A}|\sin\theta_A + |\vec{A}|\sin\theta_B = Y$



Solve x equation for θ_B

$$|\vec{A}|\cos\theta_A + |\vec{B}|\cos\theta_B = 0$$

$$|\vec{A}|\cos\theta_A = -|\vec{B}|\cos\theta_B$$

$$\cos\theta_B = -\frac{|\vec{A}|}{|\vec{B}|}\cos\theta_A$$

$$\theta_B = \cos^{-1}\left[-\frac{|\vec{A}|}{|\vec{B}|}\cos\theta_A\right]$$

$$\theta_B = \cos^{-1}\left[-\frac{1.0}{1.8}\cos(-35)\right] = 117°$$

Physics III
Homework

3-50

$\vec{A} = 15\hat{x} - 40\hat{y}$, $\vec{B} = 31\hat{y} + 18\hat{k}$,

$\vec{C} = C_x\hat{x} + C_y\hat{y} + C_z\hat{k}$

$\vec{A} + \vec{B} + \vec{C} = 0$

3 equations

x: $\overset{A}{15} + \overset{B}{0} + \overset{C}{C_x} = 0 \Rightarrow \boxed{C_x = -15}$

y: $-40 + 31 + C_y = 0 \Rightarrow \boxed{C_y = 9}$

z: $0 + 18 + C_z = 0 \Rightarrow \boxed{C_z = -18}$

$\vec{C} = -15\hat{x} + 9\hat{y} - 18\hat{k}$