Recitation Week 1 Solutions

Ch. 1 #39

$\vec{A} = (0\hat{x} - 8\hat{y})\,m$ $\quad \vec{B} = 15.0m(\sin 30^\circ \hat{x} + \cos 30^\circ \hat{y})$

$= (7.5\hat{x} + 13.0\hat{y})\,m$

a) $\vec{A} + \vec{B}$

$= (0\hat{x} - 8.00\hat{y})\,m + (7.5\hat{x} + 13.0\hat{y})\,m$

$= (0 + 7.5\hat{x})\,m + (-8.00\hat{y} + 13.0\hat{y})\,m$

$= \boxed{(7.5\hat{x} + 5.0\hat{y})\,m}$

b) $\vec{B} + \vec{A}$

$= (7.5\hat{x} + 13.0\hat{y})\,m + (0\hat{x} - 8.00\hat{y})\,m$

$= (7.5\hat{x} + 0\hat{x})\,m + (13.0\hat{y} - 8.00\hat{y})\,m$

$= \boxed{(7.5\hat{x} + 5.0\hat{y})\,m}$ *NOTE same as part a

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

c) $\vec{A} - \vec{B}$

$= (0\hat{x} - 8.00\hat{y})\,m - (7.5\hat{x} + 13.0\hat{y})\,m$

$= (0\hat{x} - 7.5\hat{x})\,m + (-8.00\hat{y} - 13.0\hat{y})\,m$

$= \boxed{(-7.5\hat{x} - 21.0\hat{y})\,m}$

d) $\vec{B} - \vec{A}$

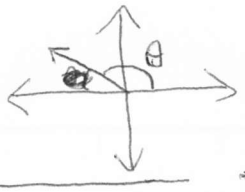
$= (7.5\hat{x} + 13.0\hat{y})\,m - (0\hat{x} - 8.00\hat{y})\,m$

$= (7.5\hat{x} - 0\hat{x})\,m + (13.0\hat{y} + 8.00\hat{y})\,m$

$= \boxed{(7.5\hat{x} + 21.0\hat{y})\,m}$ *NOTE opposite of part c

$\vec{A} - \vec{B} = -(\vec{B} - \vec{A})$

Ch. 1 #40



a) $A_x = -8.60\text{ cm}$ $A_y = 5.20\text{ cm}$

$|\vec{A}| = \sqrt{A_x^2 + A_y^2} = \sqrt{(-8.60)^2 + (5.20)^2} = \sqrt{73.96 + 27.04} = \boxed{10.05\text{ cm}}$

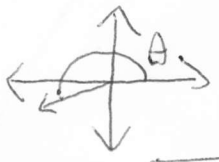
$\tan\theta = \frac{A_y}{A_x} = \frac{5.20}{-8.60} = -0.60$

$\theta = \tan^{-1}(-0.60) = -30.96°$

But we know its in 2nd quadrant and $\tan^{-1}$ goes from -90 to 90.

So we add 180

$\theta = -30.96 + 180 = \boxed{149.04°}$



b) $A_x = -9.70\text{ cm}$ $A_y = -2.45\text{ cm}$

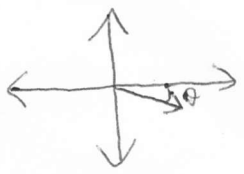
$|\vec{A}| = \sqrt{A_x^2 + A_y^2} = \sqrt{(9.7)^2 + (-2.45)^2} = \sqrt{94.09 + 6.00} = \boxed{10.00\text{ cm}}$

$\tan\theta = \frac{A_y}{A_x} = \frac{-2.45}{-9.70} = 0.25$

$\theta = \tan^{-1} 0.25 = 14.18°$

Again, we know it is in 3rd quadrant so we add 180

$\theta = 14.18 + 180 = \boxed{194.18°}$



c) $A_x = 7.75\text{ km}$ $A_y = -2.70\text{ km}$

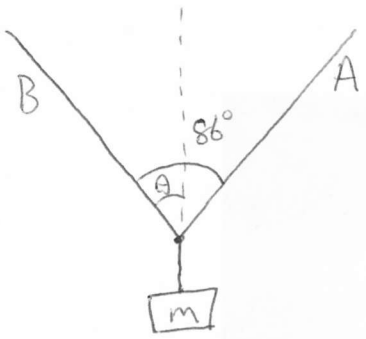
$|\vec{A}| = \sqrt{A_x^2 + A_y^2} = \sqrt{(7.75)^2 + (-2.70)^2} = \sqrt{60.06 + 7.29}$

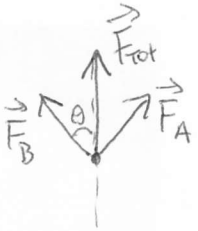
$= \boxed{8.21\text{ km}}$

$\tan\theta = \frac{A_y}{A_x} = \frac{-2.70}{7.75} = -0.35$

$\theta = \boxed{-19.21°}$ or $\theta = -19.21 + 360 = 340.79°$

Ch.1 #46





$\theta = \frac{86}{2} = 43°$

$F_{Ax} = -F_{Bx}$

$F_{Tot\,x} = 0$

$F_{Tot\,y} = F_{Ay} + F_{By} = 372\ N$

$F_{Ay} = F_{By}$

$F_{Ay} = F_A \cos\theta = F_A \cos 43$

$2F_{Ay} = F_{Tot\,y} = 372\ N = 2 \cdot F_A \cos 43$

$F_A \cos 43 = 186\ N$

$F_A = \frac{186}{\cos 43} = \boxed{254\ N}$

Ch.1 #47

$\vec{A} = \boxed{(0\hat{i} - 8.00\hat{j})\ m}$

$\vec{B} = 15.0\ m \cdot (\sin 30\,\hat{i} + \cos 30\,\hat{j}) = \boxed{(7.5\hat{i} + 13.0\hat{j})\ m}$

$\vec{C} = 12.0\ m \cdot (-\cos 25\,\hat{i} - \sin 25\,\hat{j}) = \boxed{(-10.9\hat{i} - 5.1\hat{j})\ m}$

$\vec{D} = 10.0\ m \cdot (-\sin 53\,\hat{i} + \cos 53\,\hat{j}) = \boxed{(-8.0\hat{i} + 6.0\hat{j})\ m}$

Ch. 1 #49

a) $\vec{A} = 3.60\ m \cdot (\cos 70\,\hat{x} + \sin 70\,\hat{y}) = \boxed{(1.23\,\hat{x} + 3.38\,\hat{y})\ m.}$

$\vec{B} = 2.4\ m \cdot (-\cos 30\,\hat{x} - \sin 30\,\hat{y}) = \boxed{(-2.1\,\hat{x} - 1.2\,\hat{y})\ m}$

b) $\vec{C} = 3.00\vec{A} - 4.00\vec{B}$

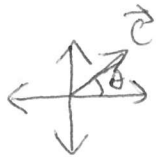
$= 3.00\,(1.23\hat{x} + 3.38\hat{y})\,m - 4.00\,(-2.1\hat{x} - 1.2\hat{y})\,m$

$= (3.69\hat{x} + 10.14\hat{y})\,m - (-8.4\hat{x} - 4.8\hat{y})\,m$

$= \boxed{(12.09\hat{x} + 14.94\hat{y})\ m.}$

c) $|\vec{C}| = \sqrt{(12.09)^2 + (14.94)^2} = \sqrt{146.17 + 223.20}$

$= \boxed{19.22\ m}$



$\tan\theta = \frac{C_y}{C_x} = \frac{14.94}{12.09} = 1.24$

$\theta = \boxed{51.02^\circ}$

Ch. 1 #50

$\vec{A} = 4.00\hat{x} + 3.00\hat{y}$ $\quad\quad$ $\vec{B} = 5.00\hat{x} - 2.00\hat{y}$

a) $|\vec{A}| = \sqrt{(4.00)^2+(3.00)^2} = \sqrt{16.00+9.00} = \boxed{5.00}$

$|\vec{B}| = \sqrt{(5.00)^2+(-2.00)^2} = \sqrt{25.00+4.00} = \boxed{5.39}$

b) $\vec{A} - \vec{B}$

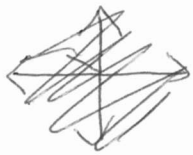
$= (4.00\hat{x} + 3.00\hat{y}) - (5.00\hat{x} - 2.00\hat{y})$

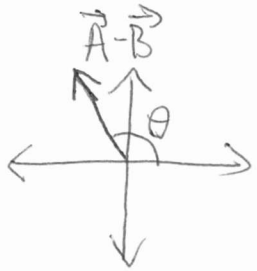
$= \boxed{-1.00\hat{x} + 5.00\hat{y}}$

c) $|\vec{A} - \vec{B}|$

$= \sqrt{(-1.00)^2+(5.00)^2} = \sqrt{1.00+25.00}$

$= \boxed{5.10}$





$\tan\theta = \frac{5.00}{-1.00} = -5.00$

$\theta = -78.69°$ but it is in 2nd quadrant, so add 180

$\theta = -78.69 + 180 = \boxed{101.31°}$

d)