Name_____

Phys 121
Quiz #1

1. Convert $9.16 \times 10^{-1} \frac{\text{cm}^3}{\text{s}}$ to units of $\frac{\text{m}^3}{\text{min}}$.

$$\left(9.16\times10^{-1}\ \frac{\text{cm}^3}{\text{s}}\right)\left(\frac{1\ \text{m}}{100\ \text{cm}}\right)^3\left(\frac{60\ \text{s}}{1\ \text{min}}\right) = \boxed{5.50\times10^{-5}\ \frac{\text{m}^3}{\text{min}}}$$

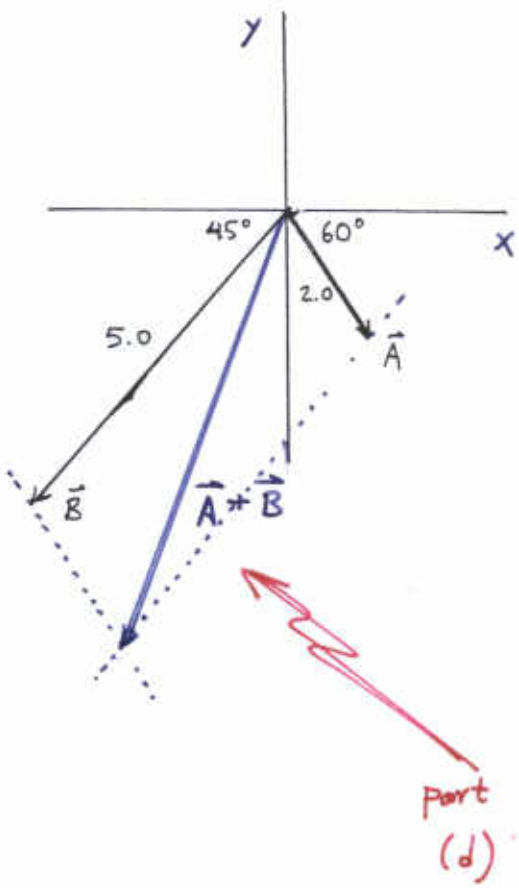
2. Vector **A** has magnitude 2.0 and is directed at 60° *below* the $+x$ axis. Vector **B** has magnitude 5.0 and is directed at 45° below the $-x$ axis, as shown.

a) Find the x and y components of vector **A**.

$A_x = 2.0 \cos 60° = \boxed{1.0}$

$A_y = -2.0 \sin 60° = \boxed{-1.73}$

Here I have used simple trigonometry and put in the correct signs (by hand)



b) Find the x and y components of vector **B**.

$B_x = -5.0 \cos 45° = \boxed{-3.54}$

$B_y = -5.0 \sin 45° = \boxed{-3.54}$

c) Find the magnitude and direction of the vector $\mathbf{A} + \mathbf{B}$

We subtract 180° since $\vec{A} + \vec{B}$ must point as sketched in part (d).

Let $\vec{C} = \vec{A} + \vec{B}$, then

$C_x = A_x + B_x = -2.54$

$C_y = A_y + B_y = -5.26$

Magnitude $C = \sqrt{C_x^2 + C_y^2} = \boxed{5.86}$

Angle $= \theta = \tan^{-1}\left(\frac{-5.26}{-2.54}\right) = 64.2° - 180° = \boxed{-116°}$

d) Sketch the vector $\mathbf{A} + \mathbf{B}$ in the diagram above.

3. A car is initially traveling at $15.3\frac{\text{m}}{\text{s}}$ and decelerates at $4.3\frac{\text{m}}{\text{s}^2}$. Find:

a) The time elapsed until the car comes to a halt.

With $v_0 = 15.3\ \text{m/s}$, $v = 0\ \text{m/s}$ and $a = -4.3\ \text{m/s}^2$, we find

$$t = \frac{v - v_0}{a} = \frac{0\ \text{m/s} - 15.3\ \text{m/s}}{-4.3\ \text{m/s}^2} = \boxed{3.6\ \text{s}}$$

b) The distance the car travels as it comes to a halt.

Using $v^2 = v_0^2 + 2ax$ we find:

$$x = \frac{v^2 - v_0^2}{2a} = \frac{(0\ \text{m/s})^2 - (15.3\ \text{m/s})^2}{2(-4.3\ \text{m/s}^2)} = \boxed{27\ \text{m}}$$

You must show all your work!

$$1 \text{ min} = 60 \text{ s}$$

$$A_x = A\cos\theta \qquad A_x = A\cos\theta \qquad \theta = \tan^{-1}\frac{A_y}{A_x}$$

$$v = v_0 + at \qquad x = v_0 t + \tfrac{1}{2}at^2 \qquad v^2 = v_0^2 + 2ax \qquad x = \tfrac{1}{2}(v + v_0)t$$