Name_____

Phys 121, Section 2
Quiz #1

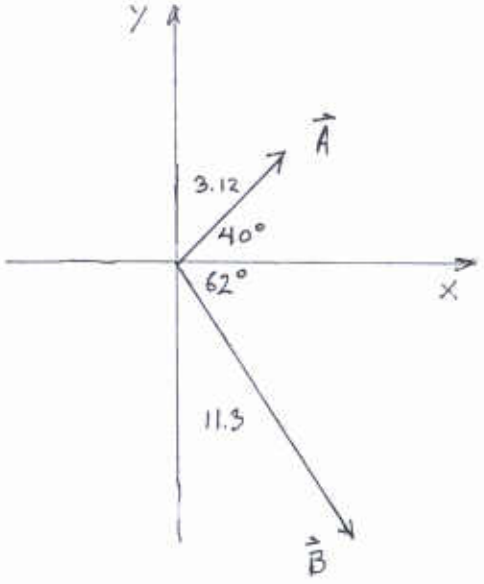
1. Express $0.106 \frac{g}{cm^2}$ in units of $\frac{kg}{m^2}$.

$$0.106 \frac{g}{cm^2} = \left(0.106 \frac{g}{cm^2}\right)\left(\frac{1\ kg}{10^3\ g}\right)\left(\frac{100\ cm}{1\ m}\right)^2$$

$$= \boxed{1.06 \frac{kg}{m^2}}$$

2. Vector **A** has magnitude 3.12 and points at 40.0° above the x axis; vector **B** has magnitude 11.3 and points at 62° below the x axis.

Find the magnitude and direction of **A** + **B**.



$A_x = (3.12)\cos 40° = 2.390$

$A_y = (3.12)\sin 40° = 2.005$

$B_x = (11.3)\cos(-62°) = 5.305$

$B_y = (11.3)\sin(-62°) = -9.977$

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

$C_x = A_x + B_x = 7.695$

$C_y = A_y + B_y = -7.972$

mag. of $\vec{A} + \vec{B}$ is $C = \sqrt{C_x^2 + C_y^2} = \boxed{11.08}$

Direction is $\tan^{-1}\left(\frac{C_y}{C_x}\right) = \boxed{-46.0°}$

3. A rock is thrown straight *down* from the top of a tall building with speed 10.0 $\frac{m}{s}$.

a) After 3.0 s, what is the *speed* of the rock?

$v_0 = -10.0\ \frac{m}{s}$ $\quad a = -9.8\ \frac{m}{s^2}$

At $t = 3.0\ s$,

$v = v_0 + at = (-10.0\ \frac{m}{s}) + (-9.8\ \frac{m}{s^2})(3.0\ s)$

$= -39.4\ \frac{m}{s} \Rightarrow$ Speed is $|v| = \boxed{39.4\ \frac{m}{s}}$

a) After 3.0 s, how far has the rock fallen?

At $t = 3.0\ s$,

$y = v_0 t + \frac{1}{2} a t^2 = (-10.0\ \frac{m}{s})(3.0\ s) + \frac{1}{2}(-9.8\ \frac{m}{s^2})(3.0\ s)^2$

$= -74.1\ m$

Rock has fallen $\boxed{74.1\ m}$

You must show all your work!

$A_x = A\cos\theta \quad A_y = A\sin\theta$

$A = \sqrt{A_x^2 + A_y^2}$

$\theta = \tan^{-1}\left(\frac{A_y}{A_x}\right)$

$g = 9.8\ \frac{m}{s^2} \quad v = v_0 + at \quad x = v_0 t + \frac{1}{2} a t^2$

$v^2 = v_0^2 + 2ax \quad x = \frac{1}{2}(v_0 + v)t$

$1\ m = 10^2\ cm$

$1\ kg = 10^3\ g$