Physics 2110 - Quiz 1 Name ________________________

1. What are the dimensions of X given that P has dimensions of ML/T , t has dimensions of T, and A has dimensions of L/T^2 . (Show your work) (3 pts)

$$\frac{P}{t} = X \cdot A$$

$$X = \frac{P}{At} \quad \Rightarrow \quad [X] = \frac{M\frac{L}{T}}{\frac{L}{T^2}T} = \frac{\frac{ML}{T}}{\frac{L}{T}} = M$$

2. For the following powers of 10, name the prefix and the symbol used to represent it. (2 pts)

	Prefix name	Prefix symbol
10^9	_______giga___________	___________G____________
10^{-12}	_______pico___________	____________p___________

3. We know that 1.0000 bushel equals 1.2444 ft³ and that 1.0000 gallon equals 0.13368 ft³. How many bushels are there is 12.40 gallons? (Use the proper number of significant digits.) (2 pts)

$$12.40\ gal\ \left(\frac{0.13368\ ft^3}{1.0000\ gal}\right)\left(\frac{1.0000\ bushel}{1.2444\ ft^3}\right) = 1.02\ bushel$$

4. A jet travels at 825 km/hr at an angle 30.0º north of west. Aligning the x-axis with the direction east and the y-axis with the direction north, what is the velocity of the jet in unit-vector notation? (3 pts)

You can approach this problem two ways, but you will still get the same answer. The first way is to strictly use the equations given in class for converting between polar coordinates to unit vector notation. When you do that, you must use an angle relative to the positive x-axis. Since 30° north of west is 150° degrees counterclockwise from the x-axis, then we get the following answer.

$$\vec{v} = v\cos\theta\,\hat{\imath} + v\sin\theta\,\hat{\jmath}$$

$$\vec{v} = \left(825\frac{km}{hr}\right)\cos 150°\,\hat{\imath} + \left(825\frac{km}{hr}\right)\sin 150°\,\hat{\jmath} = (-714\frac{km}{hr})\hat{\imath} + \left(413\frac{km}{hr}\right)\hat{\jmath}$$

$$\vec{v} = \{-714\,\hat{\imath} + 413\,\hat{\jmath}\}\frac{km}{hr}$$

The alternate is to use the diagram and use the acute angle provided. When you do this, you need to keep track of what quadrant you are in. Since we are in the II quadrant, the x-component will be negative and the y-component will be positive. I will explicitly put these signs into the equation and then use the acute angle provided.

$$\vec{v} = -\left(825\frac{km}{hr}\right)\cos 30°\,\hat{\imath} + \left(825\frac{km}{hr}\right)\sin 30°\,\hat{\jmath} = (-714\frac{km}{hr})\hat{\imath} + \left(413\frac{km}{hr}\right)\hat{\jmath}$$

$$\vec{v} = \{-714\,\hat{\imath} + 413\,\hat{\jmath}\}\frac{km}{hr}$$