

Math 335
Homework #1

Due date: Monday, January 28, 2008

Please show all work in detail to receive full credit. Late homework is not accepted.

1. Classify the following quantities according to whether they are vectors or scalars: magnetic field strength, energy, mass, acceleration, air pressure, electric charge.
2. If $\vec{a} = (1, -1, 1)$ and $\vec{b} = (0, 2, 1)$, find $\vec{a} \cdot \vec{b}$, and $\vec{a} \times \vec{b}$. Find the angle between vectors \vec{a} and \vec{b} (this may require a calculator).
3. For the two vectors of problem 2, find the component of \vec{a} in the direction of \vec{b} , and the component of \vec{b} in the direction of \vec{a} .
4. Find the angle between the main diagonal of a cube and one of its edges. Make a sketch to illustrate the problem (it may be useful to go over the problem 1.6 on p. 8).
5. Find the equation of a line passing through points $(0,2,0)$ and $(1,0,0)$, in the vector form, $\vec{r} = \vec{a} + \lambda \vec{b}$, where λ is any real number (a parameter). Make a sketch. Check that it agrees with the slope-intercept equation of this line in a plane ($y = ax + b$).
6. Draw vectors \vec{a} and \vec{b} that satisfy the condition $|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2$
7. Expand the following expressions (use the distributive property and other properties of the dot and cross vector products); simplify if possible:
 - a) $|\vec{a} \times \vec{b}|^2 + (\vec{a} \cdot \vec{b})^2$
 - b) $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$
 - c) $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$
8. Find the equation of the plane that is perpendicular to the vector $(1,-1,3)$ and passes through the point $(1, 0, 2)$ (Review your Calculus III material)