Homework 1, due Friday, May 23rd in class.

(1) Compute the sum of the vectors $(-1,-1)$ and $(2,3)$, and illustrate this sum geometrically.

(2) Find the angle between the vectors $(0,1,1)$ and $(1,0,1)$.

(3) Find a unit vector that is orthogonal to both $\vec{i}+\vec{j}$ and $\vec{i}+\vec{k}$.

(4) For $\vec{a}=(1,0,0)$, $\vec{b}=(1,1,0)$, and $\vec{c}=(1,1,1)$, compute the following quantities if they have meaningful answers.

(a) $\vec{a}\times(\vec{b}\times\vec{c})$

(b) $(\vec{a}\cdot\vec{b})\times(\vec{a}\cdot\vec{c})$

(c) $(\vec{a}\cdot\vec{b})\ \vec{c}$

(d) $(\vec{a}\times\vec{b})\cdot(\vec{a}\times\vec{c})$

(e) $\vec{a}\cdot(\vec{b}\times\vec{c})$

(f) $\vec{a}\times(\vec{b}\cdot\vec{c})$

(5) Find an implicit equation for the plane that contains the point $(2,0,-1)$ and which has normal vector $2\vec{j}+\vec{k}$.

(6) Find an implicit equation for the plane that contains the points $(1,1,0)$, $(1,0,1)$, and $(0,1,1)$.

(7) Compute the projection of the vector $(1,1,1)$ onto the direction of the vector $(2,0,0)$.

(8) Determine the type of quadric surface defined by $x^2+(\frac{y}{9})^2+z^2=1$ and describe its intersection with the plane $y=0$.

(9) Describe the intersection of a plane $z=s$ with the surface given by $x^2+4y^2-4z^2=-1$. For which values of s is the intersection empty?

(10) Rewrite the quadric surface $z=x^2-y^2$ in spherical coordinates in the form $\rho=f(\theta,\phi)$.

(11) Find the center and radius of the sphere $x^2+y^2+z^2=x+y+z$.

(12) Find the largest sphere contained in the first octant (i.e. $x\geq 0$, $y\geq 0$, $z\geq 0$) with center $(5,4,3)$.