Math 181 Name ___________________
Fall, 2008

Homework #20
Due Wednesday, December 3
No late papers accepted! No excuses!

1. Express the vector as a product of its length and direction.

$$\vec{v} = \vec{i} + 4\vec{j} - 8\vec{k}$$

2. Let **A, B,** and **C** be vectors. Which of the following make sense, and which do not? Give reasons for your answers.

a) $\left(\vec{A} \times \vec{B}\right) \cdot \vec{C}$

b) $\vec{A} \times \left(\vec{B} \cdot \vec{C}\right)$

c) $\vec{A} \times \left(\vec{B} \times \vec{C}\right)$

d) $\vec{A} \cdot \left(\vec{B} \cdot \vec{C}\right)$

3. Find the parametric equations for the line through P(1, 2, 0) and Q(1, 1, --1).

4. Let $\vec{u} = \langle 3,-2,1 \rangle, \vec{v} = \langle 2,-4,-3 \rangle, \vec{w} = \langle -1,2,2 \rangle$.

a) Find $|\vec{u}|$.
b) Find the angle between **u** and **v**.
c) Show that $\vec{u} \cdot \vec{u} = |\vec{u}|^2$
d) Determine a unit vector perpendicular to the plane containing **v** and **w**.
e) Determine the projection of **w** onto **u**.
f) Show that $\vec{u} \times \vec{v} = -(\vec{v} \times \vec{u})$
g) Find the volume of the solid whose edges are **u**, **v**, and **w**.
h) Find the work done in moving an object along the vector **u**, if the applied force is **w**.
i) Find the direction angles of **v**.
j) Find the area of the parallelogram having **u** and **v** as adjacent sides.

5. Find an equation of the plane determined by the points $(1,0,-1)$, $(2,2,1)$, $(4,1,2)$.

4. The plane $3x-4y+2z=8$ intersects the xy-plane in a line. What is the equation of this line?

5. Find the intersection of the planes $x+y+z=1$ and $3x-2y+z=5$.

6. Describe the set of all points $P=(x,y,z)$ satisfying $x^2+y^2\le 4$ in both cylindrical and spherical coordinates.

7. Show that the cylindrical equation $r^2\left(1-2\sin^2\theta\right)+z^2=1$ is a hyperboloid of one sheet.

8. Find parametric equations of the line passing through $(1,2,-3)$ and parallel to $\vec{v}=\langle 4,5,-7\rangle$.