Math 280 B

FIRST HOUR EXAM

NAME____

General Notes:

1. Show work.
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam. Carry out any calculations to the point at which you would need a calculator (for example, to take the square root of a number) and leave it in that form.

Friday, Sept. 25, 2009
100 pts.

I. Some basics

1. (5 pts.) Find the distance between P(1, 2, 1) and Q(2, 1, 2). Please leave your answer in radical form (that is, on this and following problems, there is no need to calculate square roots)

2. (5 pts.) Write the equation of the vector PQ in component and **i**, **j**, **k** form

3. (5 pts.) Write the parametric form of the equation of the line segment between P and Q (i.e., when t = 0 we should get P, when t = 1 we should get Q.

4. (5 pts.) Finally, find the unit vector in the PQ direction.

II. Dot product questions

1. (5 pts.) What is the value of the dot product $\vec{u} \cdot \vec{v}$ in terms of the angle θ between the two vectors?

2. (5 pts.) Suppose that **u** = 2**i** - **j** - **k** and that **v** = 2**i** + **k** - **j**. What is the value of $\vec{u} \cdot \vec{v}$?

3. (5 pts.) What does it mean if the dot product $\vec{u} \cdot \vec{v}$ is zero?

4. (10 pts.) We sometimes wish to resolve a vector in terms of others. For **u** and **v** above, what is the scalar component of the projection of **u** in the direction of **v**? What is the projection of **u** onto **v**?

III. Cross product questions

1. (10 pts.) What is the definition of the cross (vector) of two non-zero non-parallel vectors **u** and **v**?

2. (5 pts.) There is a nice geometric interpretation of the length of the vector product of two vectors. What is it?

3. (5 pts.) Complete the following table

$\vec{i} \times \vec{j}$	$\vec{k}$
$\vec{j} \times \vec{k}$	
$\vec{i} \times \vec{k}$	
$\vec{k} \times \vec{i}$	

4. (15 pts.) Suppose that that **u** = 2**i** - **j** - **k** and that **v** = 2**i** + **k** - **j**. Calculate $\vec{u} \times \vec{v}$.

III. Other stuff

1. (15 pts.) Find the equation of the plane passing through the point (1, 2, 3) and perpendicular (normal) to the vector **i** +2 **j** **-k**. Where does this plane intersect the x, y, and z axis?

2. (5 pts.) Finally, what is the **box product** of three vectors, and what is its geometrical interpretation?