Math 10C First Midterm 40 points Oct. 18, 2004

- PRINT NAME _____
- Write version on your blue book and *hand in this exam inside your blue book.* VERSION B
- Put your name, ID number, and section number (or time) on your blue book.
- You may have ONE 2-sided page of notes. NO CALCULATORS are allowed.
- You may leave square roots in your answers, but NO trig functions.
- **You must show your work to receive credit.**

1. (12 points) In this problem,
   - $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$ are vectors in $\mathbb{R}^2$ (the plane),
   - $\mathbf{u}$, $\mathbf{v}$ and $\mathbf{w}$ are vectors in $\mathbb{R}^3$ (space) and
   - s is a scalar.

   For each of the following, decide if it makes sense and:
   - if it makes sense, describe the answer, for example, "a vector in $\mathbb{R}^3$;"
   - if it does not make sense, explain why, for example, "cannot cross product a vector and a scalar."

   (a) $\mathbf{a} + (\mathbf{b} \cdot \mathbf{c})$ (b) $\mathbf{a} \times \mathbf{b}$ (c) $\mathbf{u} \times \mathbf{v}$ (d) $\mathbf{a} \cdot (\mathbf{v} \times \mathbf{w})$

2. (12 points) Let $\mathbf{a} = 2\mathbf{i} + \mathbf{j}$ be a vector in $\mathbb{R}^2$.
   (a) Find a vector in $\mathbb{R}^2$ the same direction as $\mathbf{a}$ that has length 3.
   (b) Find a nonzero vector in $\mathbb{R}^2$ that is perpendicular to $\mathbf{a}$.

3. (6 points) A triangle has vertices $A\,(1, 0, -1)$, $B\,(0, 3, -1)$ and $C\,(3, 0, 0)$. Find its area.

4. (5 points) Find an equation for the plane through the point $(2, -1, 1)$ and is perpendicular to the vector $\langle 1, 1, 2\rangle$.
   Do NOT leave vectors in your answer.

5. (5 points) Find the distance from the point $(1, 2, 3)$ to the plane whose equation is $(2\mathbf{i} - 3\mathbf{j} + \mathbf{k}) \cdot \mathbf{r} = 3$. (As usual $\mathbf{r} = \langle x, y, z\rangle = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$.)

END OF EXAM