Name: _____ **PID:** _____

TA: _____ **Sec. No:** _____ **Sec. Time:** _____

Math 20C
Midterm Exam 1 (blue)
April 23, 2008

Turn off and put away your cell phone.
No calculators or any other devices are allowed on this exam.
You may use one page of notes, but no books or other assistance on this exam.
Read each question carefully, answer each question completely, and show all of your work.
Write your solutions clearly and legibly; no credit will be given for illegible solutions.
If necessary, write "see other side" and continue working on the back of the same sheet.
If any question is not clear, ask for clarification.

#	Points	Score
1	6	
2	6	
3	6	
4	6	
Σ	24	

1. Let $P = (6, 4, -1)$, $Q = (5, 7, 1)$ and $R = (6, 9, 0)$ be three points in $\mathbb{R}^3$.

   (a) (4 points) Find a formula $a\,x + b\,y + c\,z = d$ for the plane containing the points P, Q and R.

   (b) (2 points) The points P, Q and R form a triangle $\triangle PQR$ in $\mathbb{R}^3$. Determine whether $\angle Q$ (the angle at the vertex Q) is an acute, obtuse or right angle. Be sure to justify your answer.

2. (6 points) Find parametric equations for the line of intersection of the two planes given by $6x - 3y + 2z = 2$ and $x + 2y - 2z = 1$.

3. Tom is chasing Jerry up a spiral staircase. The position of Tom at time t is $\mathbf{T}(t) = \langle \cos(3\pi t), \sin(3\pi t), 3t \rangle$ and the position of Jerry is $\mathbf{J}(t) = \langle \cos(\pi t), \sin(\pi t), t + 4 \rangle$. The chase starts at time $t = 0$.

   (a) (3 points) At what time does Tom catch Jerry?

   (b) (3 points) What is the distance covered by Tom from time $t = 0$ until he catches Jerry?

4. (6 points) Let L be the line through the points $A = (7, -2, 5)$ and $B = (7, 4, -3)$. There are two points on L that are a distance 5 units away from A: one on the same side of A as B, and the other on the opposite side from B. Compute the coordinates of the point on line L that is 5 units from A on the opposite side from B.

Did you remember to:

- **Fill out your name, student ID number, and TA and section information on the front?**
- **Check your work?**

Exam booklets will be collected promptly when time is called.