Math 222 Quiz 11
Dec. 2, 2010

Your Name: Your Section:

Instructions: Since we missed many topics, for this quiz, time is 30 minutes and the total score is 15 points. Wait until the last minute.

1. (a) \( P(1, 1, 1), Q(2, 1, 3), R(3, -1, 1) \). Find the area of the triangle determined by these three points and one unit vector perpendicular to this triangle. If the points are \( P(1, 1), Q(2, 1), R(3, -1) \), find the area again. (4')
   (b) \( \mathbf{u} = 2\mathbf{i} + \mathbf{j}, \mathbf{v} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}, \mathbf{w} = \mathbf{i} + 2\mathbf{k} \). Find the triple scalar product \( (\mathbf{u} \times \mathbf{v}) \cdot \mathbf{w} \) and the volume of the parallelepiped determined by these three vectors. (2')

2. \( P(3, -2, 1) \), \( L: x = 1 + 2t, y = 2 - t, z = 3t \). Find the line through \( P \) and parallel to \( L \) (2'), the distance between \( P \) and \( L \) (2'), and the plane through \( P \) and perpendicular to \( L \) (2').

3. Choose THREE of the following. Circle directly. No need to explain. If you answer more than three, I'll grade the first three you answered. (3')
   ① If \( \angle AOB = \pi/3 \), the angle between \( \overrightarrow{AO} \) and \( \overrightarrow{OB} \) is: (\( \pi/3 \) vs 2\( \pi/3 \))
   ② Is \( \mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) \) equal to \( \mathbf{c} \cdot (\mathbf{b} \times \mathbf{a}) \): (Yes vs No)
   ③ If \( \mathbf{u} \cdot \mathbf{v}_1 = \mathbf{u} \cdot \mathbf{v}_2 \), is \( \mathbf{v}_1 = \mathbf{v}_2 \) right: (Yes vs No)
   ④ If the relation in ③ is right for all \( \mathbf{u} \), what's the answer: (Yes vs No)
   ⑤ \( \mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) \) is always the volume of the parallelepiped determined by the three vectors even if the determinant may be negative: (True vs False)
   ⑥ \( |\mathbf{a} \times \mathbf{b}|^2 + |\mathbf{a} \cdot \mathbf{b}|^2 \) equals: (\( |\mathbf{a} + \mathbf{b}|^2 \) vs \( |\mathbf{a}|^2|\mathbf{b}|^2 \))