Sultan Qaboos University-College of Science
Department of Mathematics and Statistics
MATH 3171 - Linear Algebra & Multivariate Calculus for Engineers
Spring Semester 2008 - QUIZ # 3-A

Date: 7 April 2008 **Time Allowed: 20 minutes**
NAME: **ID NO.**

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1. [4 marks] Find the projection (component) of the vector $a = [-2, 3, -1]$ in the direction of $b = [4, -2, 0]$.

2. [5 marks] Is the following statement true or false? Explain your answer. For all vectors $u(t) = [u_1(t), u_2(t), u_3(t)]$ and $v(t) = [v_1(t), v_2(t), v_3(t)]$,
   $\frac{d}{dt}(u(t) \cdot v(t)) = \frac{d}{dt}u(t) \cdot \frac{d}{dt}v(t)$

3. [6 marks] Find the area of the parallelogram if the vertices are (1,1,1), (4,4,4), (8,-3,14) and (11,0,17).

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1. [6 marks] Find the angles of the parallelogram if the vertices are (1,2,3), (3,5,7), (2,0,9) and (4,3,13).

2. [5 marks] Give an example of a vector $u(t) = [f(t), g(t), h(t)]$ such that not all $f(t), g(t), h(t)$ are constants but $|u(t)|$ is constant. What is the relationship between $u(t)$ and $\frac{d}{dt}u(t)$? Explain your answer.

3. [4 marks] Find $\dfrac{\partial v}{\partial x}, \dfrac{\partial v}{\partial y}$ and $\dfrac{\partial^2 v}{\partial y \partial z}$ if $v(x, y, z) = [\cos x \ cosh \ y, -\sin \ x \ sinh \ y, \ln(yz)]$.

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1. [5 marks] Show that for any two vectors u and v, $|u+v| \leq |u| + |v|$.

2. [6 marks] Find the volume of the Tetrahedron if thevertices are (1,1,1), (5,-7,3), (7,4,8) and (10,7,4).

3. [4 marks] Find $\dfrac{\partial^2 v}{\partial x^2}$ and $\dfrac{\partial^2 v}{\partial x \partial y}$ if $v(x,y,z) = \cos(xyz)(\mathbf{i}+\mathbf{j})$.

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1. [4 marks] Is the following statement true or fallse? Explain your answer. For all vectors u, v and w with $u \neq 0$, if $u \cdot v = u \cdot w$ then $v = w$.

2. [6 marks] Find two unit normal vectors to the plane through the points (1,3,0), (2,0,8), (0,2,2) and then find the equation of the plane.

3. [5 marks] Find $\dfrac{\partial v}{\partial x}, \dfrac{\partial v}{\partial y}$ and $\dfrac{\partial^2 v}{\partial x \partial z}$ if $v(x, y, z) = \left[\frac{1}{2}\ln(x^2 + y^2), \tan^{-1}(\frac{y}{x}), \overline{e}^{z}\right]$.