Sultan Qaboos University-College of Science
Department of Mathematics and Statistics
MATH 3171 - Linear Algebra & Multivariate Calculus for Engineers
Spring Semester 2008 - QUIZ # 2-A

Date: 03 March 2008 **Time Allowed: 20 minutes**
NAME: **ID NO.**

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1. Let $A = \begin{bmatrix} 9 & 1 & -2 \\ -3 & -5 & 4 \\ 6 & 8 & -7 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 1 & -2 \\ 6 & -7 & 4 \\ 8 & 3 & -9 \end{bmatrix}$.

   (a) [4 marks] Evaluate the determinant of the matrix $3(A - B)^T$.

   (b) [2 marks] Does the inverse of the matrix $(A - B)^7$ exists ? Justify your answer.

   (c) [2 marks] Use the determinant concept to evaluate the rank of the matrix $(A - B)^7$.

2. Given the matrix $A = \begin{bmatrix} 2 & 1 & 0 \\ 3 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$.

   (a) [3 marks] Find the eigenvalues of A.

   (b) [4 marks] Find an eigenvector corresponding to the smallest eigenvalue of A.

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1. $A = \begin{bmatrix} 2 & 3 & 5 \\ 1 & 4 & 7 \\ -7 & -9 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 2 & 3 \\ -1 & -6 & 5 \\ 7 & 9 & -8 \end{bmatrix}$.

   (a) [4 marks] Evaluate the determinant of the matrix $5(A+B)^T$.

   (b) [2 marks] Does the inverse of the matrix $(A+B)^9$ exists ? Justify your answer.

   (c) [2 marks] Use the determinant concept to evaluate the rank of the matrix $(A+B)^9$.

2. Given the matrix $A = \begin{bmatrix} 2 & 1 & 0 \\ 3 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$.

   (a) [3 marks] Find the eigenvalues of A.

   (b) [4 marks] Find an eigenvector corresponding to the largest eigenvalue of A.

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1. Let $A = \begin{bmatrix} 3 & 0 & 6 \\ 0 & 4 & 0 \\ 6 & 0 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 & 4 \\ 0 & 3 & 0 \\ 4 & 0 & 9 \end{bmatrix}$.

   (a) [4 marks] Evaluate the determinant of the matrix $5A^TB^T$.

   (b) [2 marks] Does the inverse of the matrix $\left(A^TB^T\right)^9$ exists ? Justify your answer.

   (c) [2 marks] Use the determinant concept to evaluate the rank of the matrix $\left(A^TB^T\right)^9$.

2. Given the matrix $A = \begin{bmatrix} 4 & 1 & 0 \\ 7 & 4 & -1 \\ 0 & 3 & 4 \end{bmatrix}$.

   (a) [3 marks] Find the eigenvalues of A.

   (b) [4 marks] Find an eigenvector corresponding to the smallest eigenvalue of A.

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1. Let $A = \begin{bmatrix} 4 & 0 & 2 \\ 0 & 3 & 0 \\ 2 & 0 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 0 & 3 \\ 0 & 5 & 0 \\ 3 & 0 & 2 \end{bmatrix}$.

   (a) [4 marks] Evaluate the determinant of the matrix $7A^TB^T$.

   (b) [2 marks] Does the inverse of the matrix $\left(A^TB^T\right)^7$ exists ? Justify your answer.

   (c) [2 marks] Use the determinant concept to evaluate the rank of the matrix $\left(A^TB^T\right)^7$.

2. Given the matrix $A = \begin{bmatrix} 4 & 1 & 0 \\ 7 & 4 & -1 \\ 0 & 3 & 4 \end{bmatrix}$.

   (a) [3 marks] Find the eigenvalues of A.

   (b) [4 marks] Find an eigenvector corresponding to the largest eigenvalue of A.