

Mathematics 135H – Linear algebra I: matrix algebra
TRENT UNIVERSITY, Fall 2007

Quizzes

Quiz #1. Friday, 21 September, 2007. [5 minutes]

1. Find the acute angle between the vectors $\mathbf{a} = [2, 1, 0]$ and $\mathbf{b} = [2, 1, \sqrt{5}]$. [5]

Quiz #2. Friday, 28 September, 2007. [10 minutes]

1. Find a linear equation $ax + by + cz = d$ of the plane containing both of the lines given by the parametric equations

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 6 \\ 7 \end{bmatrix} + t \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 6 \\ 7 \end{bmatrix} + s \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}.$$

(Note that both of these lines pass through the point $(0, 6, 7)$.) [5]

Quiz #3. Friday, 5 October, 2007. [10 minutes]

1. Solve the following system of linear equations. [5]

$$\begin{aligned} x + y + z &= 12 \\ x - y + 2z &= 18 \\ 2x + 3y - z &= 24 \end{aligned}$$

Quiz #4. Friday, 12 October, 2007. [10 minutes]

1. Determine whether $\begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix}$ is in $\text{Span} \left\{ \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \right\}$. Show your reasoning. [5]

Quiz #5. Friday, 19 October, 2007. [10 minutes]

1. Compute $(\mathbf{AB})^T$ if $\mathbf{A} = \begin{bmatrix} 6 & -3 \\ -1 & 0 \\ 2 & 5 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 1 & 2 & -4 \\ 0 & -1 & 1 \end{bmatrix}$. [5]

Quiz #5. Alternate version. [10 minutes]

1. Give examples of 3×3 matrices \mathbf{A} and \mathbf{B} such that $\mathbf{A}^T \mathbf{B}^T \neq \mathbf{B}^T \mathbf{A}^T$. [5]

Quiz #6. Friday, 9 November, 2007. [10 minutes]

1. Find the inverse matrix, if it exists, of $\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$. [5]

Quiz #6. *Alternate version. [10 minutes]*

1. Find the inverse matrix, if it exists, of $\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$. [5]

Quiz #7. Friday, 16 November, 2007. [10 minutes]

1. Suppose \mathbf{A} and \mathbf{B} are invertible $k \times k$ matrices. Solve the matrix equation

$$(\mathbf{X}^{-1}\mathbf{A})^{-1} = \mathbf{A}(\mathbf{B}^2\mathbf{A})^{-1}$$

for the (invertible) $k \times k$ matrix \mathbf{X} . Simplify your answer as much as possible. [5]

Quiz #7. *Alternate version. [10 minutes]*

1. Suppose \mathbf{A} , \mathbf{B} , and \mathbf{C} are invertible $k \times k$ matrices. Solve the matrix equation

$$(\mathbf{A}\mathbf{X}\mathbf{C})^{-1} = \mathbf{A}(\mathbf{B}^{-1}\mathbf{C})^{-2}$$

for the (invertible) $k \times k$ matrix \mathbf{X} . Simplify your answer as much as possible. [5]

Quiz #8. Friday, 23 November, 2007. [15 minutes]

1. Let $\mathbf{A} = \begin{bmatrix} 5 & 1 & -1 \\ 7 & 2 & -1 \\ 0 & 3 & 2 \end{bmatrix}$. Find bases for $\text{row}(\mathbf{A})$, $\text{col}(\mathbf{A})$, and $\text{null}(\mathbf{A})$. [5]

Quiz #8. *Alternate version. [15 minutes]*

1. Let $\mathbf{A} = \begin{bmatrix} 2 & -1 & 3 \\ 1 & -3 & 0 \\ 1 & 2 & 3 \end{bmatrix}$. Find bases for $\text{row}(\mathbf{A})$, $\text{col}(\mathbf{A})$, and $\text{null}(\mathbf{A})$. [5]

Quiz #9. Friday, 30 November, 2007. [10 minutes]

1. Find the eigenvalues of $\mathbf{A} = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$. [5]

Quiz #9. *Alternate version. [10 minutes]*

1. Find the eigenvalues of $\mathbf{A} = \begin{bmatrix} 0 & 1 \\ 1 & 3 \end{bmatrix}$. [5]

Quiz #10. Thursday, 6 December, 2007. [10 minutes]

1. Find the determinant of $\mathbf{A} = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$. [5]