MA 2071 - *Matrices & Linear Algebra I*
Sections C01 - C09

C-term Spring 2020

Date: February 12, 2020

Name: ____________________________

Quiz 4

Use of the textbook or notes is not allowed. No electronic devices or calculators are allowed. To get credit, you must show **ALL** of your work, unless otherwise stated in the problem. Please do not cheat. *"The first and worst of all frauds is to cheat one's self."*

Read each question carefully and follow the directions stated in each question.

1. (4 points) Use cofactor expansion to compute the determinant of $A = \begin{bmatrix} 1 & -1 & 2 & 1 \\ 1 & 0 & -1 & 0 \\ 2 & 0 & 3 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$.

   Answer: 5

2. (2 points) Find the determinant of $A = \begin{bmatrix} 2 & 0 & 0 & 0 & 0 & 0 \\ 1 & 5 & 0 & 0 & 0 & 0 \\ -20 & 16 & -1 & 0 & 0 & 0 \\ 100 & 2000 & -\pi & 1 & 0 & 0 \\ \sqrt{2} & -5\pi & 3/2 & 12 & 1 & 0 \\ 1 & 0 & 5 & 5 & 5 & 2 \end{bmatrix}$ **without** using cofactor expansion.

   Answer: A is lower Δ-ular, so its determinant is the product of the diagonal entries: $2 \cdot 5 \cdot -1 \cdot 1 \cdot 1 \cdot 2 = -20$

3. (4 points) Suppose A is a square matrix, i.e., its dimensions are $n \times n$. List two different statements from the Invertible Matrix Theorem such that, if either one is true, we can conclude A is invertible.
   Any two statements from the Invertible Matrix theorem in section 2.3 are acceptable.

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Read each question carefully and follow the directions stated in each question.

1. (4 points) Use cofactor expansion to compute the determinant of $A = \begin{bmatrix} 0 & 1 & 3 & 2 \\ 1 & 0 & -5 & 1 \\ 2 & 0 & 0 & 1 \\ 8 & 0 & 0 & 0 \end{bmatrix}$.

   Answer: 40

2. (2 points) Find the determinant of $A = \begin{bmatrix} 2 & 1 & -20 & 100 & \sqrt{2} & 1 \\ 0 & 5 & 16 & 2000 & -5\pi & 0 \\ 0 & 0 & -1 & -\pi & 3/2 & 5 \\ 0 & 0 & 0 & 1 & 12 & 5 \\ 0 & 0 & 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 0 & 0 & 2 \end{bmatrix}$ **without** using cofactor expansion.

   Answer: A is lower Δ-ular, so its determinant is the product of the diagonal entries: $2 \cdot 5 \cdot -1 \cdot 1 \cdot 1 \cdot 2 = -20$

3. (4 points) Suppose A is a square matrix, i.e., its dimensions are $n \times n$. List two different statements from the Invertible Matrix Theorem such that, if either one is true, we can conclude A is invertible.

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Read each question carefully and follow the directions stated in each question.

1. (4 points) Use cofactor expansion to compute the determinant of $A = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 2 & 0 & 0 \\ 3 & 0 & 0 & 6 \\ 8 & 0 & 5 & 0 \end{bmatrix}$.

   Answer: -30

2. (2 points) Find the determinant of $A = \begin{bmatrix} 2 & 0 & 0 & 0 & 0 & 0 \\ 0 & 5 & 0 & 0 & 0 & 0 \\ -20 & 0 & -1 & 0 & 0 & 0 \\ 0 & 2000 & -\pi & 1 & 0 & 0 \\ 0 & 0 & 3/2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 5 & 0 & 2 \end{bmatrix}$ **without** using cofactor expansion.

   Answer: A is lower Δ-ular, so its determinant is the product of the diagonal entries: $2 \cdot 5 \cdot -1 \cdot 1 \cdot 1 \cdot 2 = -20$

3. (4 points) Suppose A is a square matrix, i.e., its dimensions are $n \times n$. List two different statements from the Invertible Matrix Theorem such that, if either one is true, we can conclude A is invertible.
   Any two statements from the Invertible Matrix theorem in section 2.3 are acceptable.