MATH1009 – Midterm
Wednesday, November 02, 2016
Instructor: Abuzer Yakaryılmaz

Name and surname:

Student number:

Questions

(120 minutes)

1. (20 points) The matrix $A = \begin{pmatrix} 1 & 2 & 2 & 2 \\ -1 & 1 & 1 & 1 \\ -2 & 3 & 3 & 3 \\ -3 & -1 & -1 & -1 \end{pmatrix}$ is row equivalent to matrix B that is in <u>reduced row-echelon form</u>. Find B by explicitly representing the row operations you use.

2. (a) (10 points) If $A = \begin{pmatrix} 1 & -3 \\ 2 & c \end{pmatrix}$ is singular, then what is the value of c?

   (b) (20 points) Find the inverse of the following matrix:

$$B = \begin{pmatrix} 1 & -3 & 0 \\ 2 & -c & 0 \\ 0 & 0 & c \end{pmatrix}.$$

3. (25 points) If $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = 2$, then calculate the following determinant:

$$\begin{vmatrix} 0 & 1 & 0 & 0 \\ 1 & -2 & 3 & 4 \\ 0 & -6 & 2a & 2b \\ 0 & -5 & 3c & 3d \end{vmatrix}.$$

4. Let $A = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \end{pmatrix}$ be an integer matrix.

   (a) (15 points) Find A^{-1}.

   (b) (10 points) Solve the following system of linear equations:

$$\begin{array}{rcrcrcrcr} x & + & y & + & z & + & t & = & 2 \\ x & - & y & + & z & + & t & = & 4 \\ x & + & y & - & z & - & t & = & 6 \\ x & - & y & - & z & + & t & = & 10 \end{array}$$

   (Hint: You may use the answer in (a) to solve the system.)