(10)   1.   Solve, by Gauss-Jordan elimination, the system:

$$2x_1 + x_2 + x_3 = 7,$$
$$x_1 + x_2 - x_3 = 0,$$
$$3x_1 + x_2 + 3x_3 = 14.$$

(7)   2. Evaluate $\det \begin{bmatrix} 2 & 0 & 11 \\ 1 & 2 & 3 \\ -3 & -2 & -8 \end{bmatrix}$ by row reduction to the determinant of an upper

triangular matrix. No other method will be awarded marks. Show all your work.

(10)   3. Evaluate $\det \begin{bmatrix} 5 & 2 & 6 \\ 7 & 3 & 0 \\ 1 & 4 & 8 \end{bmatrix}$ by expansion using column 2. No other method will be

awarded marks. Show all your work.

(9)   4.   Let $A = \begin{bmatrix} -40 & 16 & 9 \\ 13 & -5 & -3 \\ 5 & -2 & -1 \end{bmatrix}$.

a) Find A^{-1}. Note: A^{-1} has only integer entries.

b) Use A^{-1} to solve $AX = \begin{bmatrix} 1 \\ -2 \\ -1 \end{bmatrix}$.

(10)   5. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 4 \end{bmatrix}$, $C = \begin{bmatrix} 1 & -1 \\ 2 & 1 \\ -2 & 3 \end{bmatrix}$, $D = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 2 \\ -2 & -3 & 1 \end{bmatrix}$.

Calculate defined expressions; write "undefined" beside undefined expressions.

a) $CA + DB^T =$

b) $A^2 =$

c) $B^2 =$

d) $AB - 3C =$

e) $B^T B =$

(14)   6. Let $A = \begin{bmatrix} 0 & 1 \\ 2 & 4 \end{bmatrix}$.

a) Using only elementary row operations, transform A into I_2 . Use suitable notation (or words) to explain what each elementary row operation is.

b) Find elementary matrices $E_1, E_2, ..., E_n$, such that $E_n ... E_2 E_1 A = I_2$.

c) For each E_i found in b), give the inverse E_i^{-1} .

d) Using the above results, express A as an explicit product of elementary matrices.