4COSCOO2W MATHEMATICS FOR COMPUTING

Week 9 Seminar Tasks

Matrices. Part 2

READING

Lecture 8 Notes (available on Blackboard)

Chapter 27. *Croft, T and Davison R (2016) Foundation maths, 6th ed. Harlow: Pearson.*

TASK 1. Singular & Non-Singular Matrices. Inverse of 2×2 Matrix.

See Lectures 8 Notes -Slides 5-11

Establish which of the following matrices have their inverse by any of the applicable techniques, and either explain why an inverse does not exist or calculate it.

$\mathbf{A} = [0]$ $\mathbf{B} = [-0.5]$ $\mathbf{C} = [2.5]$ $\mathbf{D} = [1 \quad 2]$ $\mathbf{E} = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\mathbf{F} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $\mathbf{G} = \begin{bmatrix} 1 & -2 \\ -2 & 4 \end{bmatrix}$ $\mathbf{H} = \begin{bmatrix} 1 & -2 \\ 2 & 4 \end{bmatrix}$ $\mathbf{J} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

TASK 2. The Inverse of 3×3 Matrix

See Lectures 8 Notes -Slides 12-25

For the following 3x3 matrices. We will use an enumeration of the elements starting with a11.

$$\mathbf{K} = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \qquad \mathbf{L} = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 2 \\ 3 & 2 & 1 \end{bmatrix} \qquad \mathbf{N} = \begin{bmatrix} 1 & -2 & 0 \\ 3 & 1 & 5 \\ -1 & 2 & 3 \end{bmatrix}$$

$$\mathbf{O} = \begin{bmatrix} 1 & 3 & -1 \\ -2 & 1 & 2 \\ 0 & 5 & 3 \end{bmatrix}$$

Find for each of these matrices:

a) Its Determinants using the diagonal method
b) Matrix of the minors of its elements, call this matrix M
c) Matrix cofactors of its elements, call this matrix C
d) The adjoint matrix called this matrix A
e) The inverse – K-1 ; L-1 ; N-1 and O-1
f) Check that the matrices you found are such that K x K-1 = I; L x L-1 = I; N x N-1 = I and O x O-1 = I where I is the identity matrix of the same size as K and L.
g) If you find any correlation between any of the given matrices, then try to find the reasoning path to determine how to use it to simplify the inverse calculation. Formulate this correlation as a general property and consider any restrictions.