

Assignment 12 – Part 1 – Math 411

(1) Find the determinants of the following matrices.

$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & -1 \end{pmatrix}, \quad \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 2 & 3 \\ 3 & 2 & 1 & 2 \\ 4 & 3 & 2 & 1 \end{pmatrix}, \quad \begin{pmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{pmatrix}, \quad \begin{pmatrix} 0 & a & b & c \\ -a & 0 & d & e \\ -b & -d & 0 & f \\ -c & -e & -f & 0 \end{pmatrix}.$$

(2) The Vandermonde Determinant: Find the determinant of

$$\begin{pmatrix} 1 & x_1 & x_1^2 \\ 1 & x_2 & x_2^2 \\ 1 & x_3 & x_3^2 \end{pmatrix}.$$

- (3) (a) Suppose A is an invertible matrix. Show that $\det(A^{-1}) = \det(A)^{-1}$.
(b) Show that the determinant of an orthogonal matrix is ± 1 .
(c) Show that the determinant of a unitary matrix is a complex number of absolute value 1.
(d) Show that the determinant of a Hermitian matrix is real.