

## Problem Set 8

November 22, 2022

**Problem 1.** (Final Exam, Fall 2020, Version A, 16 marks) Compute the  $n$ th order determinant:

$$\det A = \begin{vmatrix} a & 0 & \cdots & \cdots & 0 & 1 \\ 0 & a & \cdots & \cdots & 0 & 0 \\ \vdots & \vdots & & \ddots & \vdots & \vdots \\ \vdots & \vdots & & & \ddots & \vdots \\ 0 & 0 & \cdots & \cdots & a & 0 \\ 1 & 0 & \cdots & \cdots & 0 & a \end{vmatrix}, n \geq 2$$

**Problem 2.** (Final Exam, Fall 2020, Version B, 10 marks) Compute the  $n$ th order determinant:

$$D_n(x, y) = \begin{vmatrix} x+y & xy & & & & \\ 1 & x+y & xy & & & \\ & 1 & x+y & xy & & \\ & & 1 & \ddots & \ddots & \\ & & & \ddots & x+y & xy \\ & & & & 1 & x+y \end{vmatrix}, n \geq 2$$

**Problem 3.** Compute the  $n$ th order determinant:

$$\begin{vmatrix} 1+x_1^2 & x_1x_2 & \cdots & x_1x_n \\ x_2x_1 & 1+x_2^2 & \cdots & x_2x_n \\ \vdots & \vdots & \ddots & \vdots \\ x_nx_1 & x_nx_2 & \cdots & 1+x_n^2 \end{vmatrix}$$

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**Problem 4.** Compute the  $n$ th order determinant:

$$\det A = \begin{vmatrix} 0 & 1 & 1 & 1 & \cdots & 1 \\ 1 & 0 & 1 & 1 & \cdots & 1 \\ 1 & 1 & 0 & 1 & \cdots & 1 \\ 1 & 1 & 1 & 0 & \cdots & 1 \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & 1 & 1 & 1 & \cdots & 0 \end{vmatrix}_{n \times n}$$

**Problem 5.** Compute the determinant:

$$\begin{vmatrix} a & a^2 & a^3 & a^5 \\ b & b^2 & b^3 & b^5 \\ c & c^2 & c^3 & c^5 \\ d & d^2 & d^3 & d^5 \end{vmatrix}$$

**Problem 6.** Compute the determinant:

$$\begin{vmatrix} 1+x & 1 & 1 & 1 \\ 1 & 1-x & 1 & 1 \\ 1 & 1 & 1+y & 1 \\ 1 & 1 & 1 & 1-y \end{vmatrix}$$