1. Find the determinants of each matrix in the sequence. Try to guess the rule that works for all matrices in the sequence. Use a calculator to confirm your guess in the 5×5 case.

   (a) $G_2 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, G_3 = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}, G_4 = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}, \ldots$

   (b) $H_2 = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}, H_3 = \begin{bmatrix} 2 & 1 & \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}, H_4 = \begin{bmatrix} 2 & 1 & & \\ 1 & 2 & 1 & \\ 1 & 1 & 2 & 1 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \ldots$

   (c) $P_2 = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}, P_3 = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{bmatrix}, P_4 = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 6 & 10 \\ 1 & 4 & 10 & 20 \end{bmatrix}, \ldots$

   (here each entry is the sum of the entry to the left and the entry above)

2. Problem set §4.3, exercises 1, 13, 15, 17, 24

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3. Use Cramer's rule to find the inverse of each matrix (if it exists).

   (a) $\begin{bmatrix} 0 & 2 & -1 \\ 2 & 1 & 5 \\ -1 & 0 & 4 \end{bmatrix}$

   (b) $\begin{bmatrix} 2 & 0 & 0 & 0 \\ 1 & -2 & 1 & -1 \\ 0 & 2 & 2 & 3 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

4. Find the area of the parallelogram with sides $\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 4 \\ 1 \end{bmatrix}$. Draw it and check your answer geometrically.

5. Find the volume of the tetrahedron through the origin and the three points $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}$.

   (Hint: a tetrahedron is half a parallelepiped.)

6. Problem set §4.4, exercises 18, 19, 20, 30, 31