Compute the determinants in Exercises 1–8 using a cofactor expansion across the first row. In Exercises 1–4, also compute the determinant by a cofactor expansion down the second column.

1. $\begin{vmatrix} 3 & 0 & 4 \\ 2 & 3 & 2 \\ 0 & 5 & -1 \end{vmatrix}$

Compute the determinants in Exercises 9–14 by cofactor expansions. At each step, choose a row or column that involves the least amount of computation.

9. $\begin{vmatrix} 6 & 0 & 0 & 5 \\ 1 & 7 & 2 & -5 \\ 2 & 0 & 0 & 0 \\ 8 & 3 & 1 & 8 \end{vmatrix}$

Find the determinants in Exercises 5–10 by row reduction to echelon form.

5. $\begin{vmatrix} 1 & 5 & -6 \\ -1 & -4 & 4 \\ -2 & -7 & 9 \end{vmatrix}$

7. $\begin{vmatrix} 1 & 3 & 0 & 2 \\ -2 & -5 & 7 & 4 \\ 3 & 5 & 2 & 1 \\ 1 & -1 & 2 & -3 \end{vmatrix}$

In Exercises 19–22, find the area of the parallelogram whose vertices are listed.

19. $(0, 0), (5, 2), (6, 4), (11, 6)$

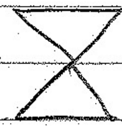
20. $(0, 0), (-1, 3), (4, -5), (3, -2)$

Homework

[redacted]

- Answer these questions.

Let G be the graph



1. Try to write down all the spanning trees of G.
2. Write down the Laplacian matrix of G.
3. Compute a cofactor of the Laplacian. Does it aggree with your answer to 1? If not, find your mistake.

In Exercises 7–10, determine the values of the parameter s for which the system has a unique solution, and describe the solution.

7. $$\begin{aligned} 6sx_1 + 4x_2 &= 5 \\ 9x_1 + 2sx_2 &= -2 \end{aligned}$$

8. $$\begin{aligned} 3sx_1 - 5x_2 &= 3 \\ 9x_1 + 5sx_2 &= 2 \end{aligned}$$