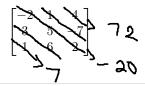# Homework 8

2.1

3. Let

$$A = \begin{bmatrix} 4 & -1 & 1 & -6 \\ 0 & 0 & -3 & 3 \\ 4 & 1 & 0 & 14 \\ 4 & 1 & 3 & 2 \end{bmatrix}$$

Find the following:

a. M_{13} *and* C_{13}.
$$M = \begin{vmatrix} 0 & 0 & 3 \\ 4 & 1 & 14 \\ 4 & 1 & 2 \end{vmatrix} = 0 \quad ; \quad C_{13} = (+1)\begin{vmatrix} 0 & 0 & 3 \\ 4 & 1 & 14 \\ 4 & 1 & 2 \end{vmatrix}$$

b. M_{23} *and* C_{23}.

11. Use the arrow technique to evaluate the determinant of the given matrix.

$$\begin{bmatrix} -2 & 1 & 4 \\ 3 & 5 & -7 \\ 1 & 6 & 2 \end{bmatrix}$$

72

−20

−7

18. Find all values of λ for which $\det(A) = 0$.

$$A = \begin{bmatrix} \lambda - 4 & 4 & 0 \\ -1 & \lambda & 0 \\ 0 & 0 & \lambda - 5 \end{bmatrix}$$

21. Evaluate $\det(A)$ by a cofactor expansion along a row or column of your choice.

$$A = \begin{bmatrix} -3 & 0 & 7 \\ 2 & 5 & 1 \\ -1 & 0 & 5 \end{bmatrix}$$

$$\det A = 0 + 5 \cdot (1) \begin{vmatrix} -3 & 7 \\ -1 & 5 \end{vmatrix} + 0 = 5 \cdot -8 = -40$$

31. Evaluate the determinant of the given matrix by inspection.

$$\begin{bmatrix} 1 & 2 & 7 & -3 \\ 0 & 1 & -4 & 1 \\ 0 & 0 & 2 & 7 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$
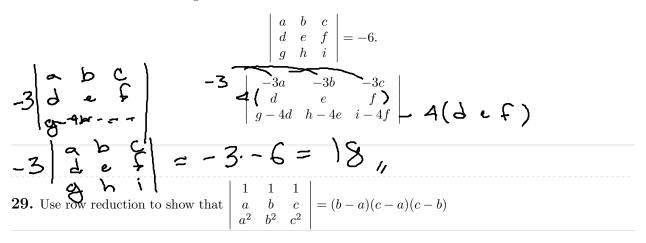
$$1 \cdot 1 \cdot 2 \cdot 3 = 6$$

$$I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \det(I) = 1$$

38. What is the maxiumum number of zeros that a 3×3 matrix can have without having a zero determinant? Explain your reasoning.

If $A_{3\times 3}$ has 7 zero entries; then A has at most 2 nonzero entries. Since there are 3 rows, there is a row of all zeros, Expanding along this zero row will produce $\det(A) = 0$.

2.2

14. Evaluate the determinant of the given matrix by reducing the matrix to row echelon form.

$$\begin{bmatrix} 1 & 0 & 0 & 6 \\ 6 & 1 & 0 & 0 \\ 0 & 0 & -3 & 0 \\ 0 & 0 & 0 & -13 \end{bmatrix} \quad \text{get} \quad \rightarrow \begin{bmatrix} 1 & 1 & \cdots \\ \vdots & 1 & 1 \end{bmatrix}, \quad \det = 39$$

$$\begin{bmatrix} 1 & -2 & 3 & 1 \\ 5 & -9 & 6 & 3 \\ -1 & 2 & -6 & -2 \\ 2 & 8 & 6 & 1 \end{bmatrix}$$

27. Evaluate the determinant given that

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = -6.$$

$$-3 \begin{vmatrix} a & b & c \\ d & e & f \\ g-4b & \cdots \end{vmatrix} \quad -3 \begin{vmatrix} -3a & -3b & -3c \\ d & e & f \\ g-4d & h-4e & i-4f \end{vmatrix} \quad 4(d \ e \ f)$$

$$-3 \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = -3 \cdot -6 = 18$$

29. Use row reduction to show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (b-a)(c-a)(c-b)$

30. description

34. description

2.3

19. description

27. description

33. description