

$$19. \begin{vmatrix} 0 & 0 & -4 & -5 \\ 0 & 0 & -2 & -2 \\ 2 & -5 & 0 & 0 \\ -5 & 4 & 0 & 0 \end{vmatrix}$$

$$20. \begin{vmatrix} a & b & 0 & 0 \\ c & d & 0 & 0 \\ 0 & 0 & a & -b \\ 0 & 0 & c & d \end{vmatrix}$$

$$21. \begin{vmatrix} 0 & -3 & 1 & 0 \\ 0 & -7 & 0 & 4 \\ -28 & 0 & -13 & 6 \\ -10 & -4 & 0 & -1 \end{vmatrix}$$

$$22. \begin{vmatrix} 1 & -1 & 2 & 0 & 0 \\ 3 & 1 & 4 & 0 & 0 \\ 2 & -1 & 5 & 0 & 0 \\ 0 & 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & -1 & 4 \end{vmatrix}$$

$$23. \begin{vmatrix} a & 0 & 0 & 0 & 0 \\ 0 & 0 & b & 0 & 0 \\ 0 & 0 & 0 & 0 & c \\ 0 & 0 & 0 & d & 0 \\ 0 & e & 0 & 0 & 0 \end{vmatrix}$$

$$24. \begin{vmatrix} 2 & -5 & -2 & -2 & 1 \\ 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & -2 & -2 & 0 \\ 2 & -5 & 0 & 0 & 1 \\ -5 & 4 & 0 & 0 & -4 \end{vmatrix}$$

$$25. \begin{vmatrix} 6 & -15 & 0 & 0 & 3 \\ 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & -2 & -2 & 0 \\ 2 & -5 & 0 & 0 & 1 \\ -5 & 4 & 0 & 0 & -4 \end{vmatrix}$$

$$26. \begin{vmatrix} 2 & 5 & -6 & 8 & 0 \\ 0 & 1 & -7 & 6 & 0 \\ 0 & 0 & 0 & 4 & 0 \\ 0 & 2 & 1 & 5 & 1 \\ 4 & -1 & 5 & 3 & 0 \end{vmatrix}$$

$$27. \begin{vmatrix} 5 & 0 & 0 & 0 & -2 \\ 0 & -1 & 0 & -1 & 0 \\ 0 & 0 & -3 & 0 & 0 \\ 0 & 5 & 0 & 2 & 0 \\ 3 & 0 & 0 & 0 & 1 \end{vmatrix}$$

De los problemas 28 al 36 calcule el determinante suponiendo que

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = 6$$

$$28. \begin{vmatrix} a_{31} & a_{32} & a_{33} \\ a_{21} & a_{22} & a_{23} \\ a_{11} & a_{12} & a_{13} \end{vmatrix}$$

$$29. \begin{vmatrix} a_{31} & a_{32} & a_{33} \\ a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{vmatrix}$$

$$30. \begin{vmatrix} a_{11} & a_{13} & a_{12} \\ a_{21} & a_{23} & a_{22} \\ a_{31} & a_{33} & a_{32} \end{vmatrix}$$

$$31. \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ 2a_{21} & 2a_{22} & 2a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$$

$$32. \begin{vmatrix} 4a_{11} & 4a_{12} & 4a_{13} \\ 4a_{21} & 4a_{22} & 4a_{23} \\ -a_{31} & -a_{32} & -a_{33} \end{vmatrix}$$

$$33. \begin{vmatrix} 4a_{11} & -2a_{12} & 3a_{13} \\ 4a_{21} & -2a_{22} & 3a_{23} \\ 4a_{31} & -2a_{32} & 3a_{33} \end{vmatrix}$$

$$34. \begin{vmatrix} a_{11} & 2a_{13} & a_{12} \\ a_{21} & 2a_{23} & a_{22} \\ a_{31} & 2a_{33} & a_{32} \end{vmatrix}$$

$$35. \begin{vmatrix} a_{11} & -a_{12} & a_{13} & a_{13} \\ a_{21} & -a_{22} & a_{22} & a_{23} \\ a_{31} & -a_{32} & a_{32} & a_{33} \end{vmatrix}$$

$$36. \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} - 3a_{11} & a_{22} - 3a_{12} & a_{23} - 3a_{13} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$$

37. Usando la propiedad 3.2.2, demuestre que si α es un escalar y A es una matriz cuadrada de tamaño $n \times n$, entonces $\det(\alpha A) = \alpha^n \det(A)$.