2. The constant 2 may be factored out of the Row 1 (Theorem 3c.).

4. The row replacement operation does not change the determinant (Theorem 3a.).

8. $\begin{vmatrix} 1 & 3 & 3 & -4 \\ 0 & 1 & 2 & -5 \\ 2 & 5 & 4 & -3 \\ -3 & -7 & -5 & 2 \end{vmatrix} = \begin{vmatrix} 1 & 3 & 3 & -4 \\ 0 & 1 & 2 & -5 \\ 0 & -1 & -2 & 5 \\ 0 & 2 & 4 & -10 \end{vmatrix} = \begin{vmatrix} 1 & 3 & 3 & -4 \\ 0 & 1 & 2 & -5 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{vmatrix} = 0$

16. $\begin{vmatrix} a & b & c \\ 3d & 3e & 3f \\ g & h & i \end{vmatrix} = 3\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 3(7) = 21$

,

2. Since $\begin{vmatrix} 5 & 0 & -1 \\ 1 & -3 & -2 \\ 0 & 5 & 3 \end{vmatrix} = 0$, the matrix is not invertible.

6. Since $\begin{vmatrix} 3 & 2 & -2 & 0 \\ 5 & -6 & -1 & 0 \\ -6 & 0 & 3 & 0 \\ 4 & 7 & 0 & -3 \end{vmatrix} = 0$, the columns of the matrix form a linearly dependent set.

42. $\det(A+B) = \begin{vmatrix} 1+a & b \\ c & 1+d \end{vmatrix} = (1+a)(1+d) - cb = 1 + a + d + ad - cb = \det A + a + d + \det B$, so

$\det(A + B) = \det A + \det B$ if and only if $a + d = 0$.

44. By Theorem 5, $\det AE = \det (AE)^T$. Since $(AE)^T = E^T A^T$, $\det AE = \det(E^T A^T)$. Now E^T is itself an elementary matrix, so by the proof of Theorem 3, $\det(E^T A^T) = (\det E^T)(\det A^T)$. Thus it is true that $\det AE = (\det E^T)(\det A^T)$, and by applying Theorem 5, $\det AE = (\det E)(\det A)$.