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For[i = 1, i ≤ 16, i++,
  A = RandomInteger[{-3, 4}, {3, 3}];
  While[Abs[Det[A]] ≠ 1, A = RandomInteger[{-3, 4}, {3, 3}]];
  Print[MatrixForm[A], "    Determinant = ",
    Det[A], "    Inverse = ", MatrixForm[Inverse[A]]]

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$$\begin{pmatrix} 1 & 0 & 0 \\ -3 & 1 & 4 \\ -2 & -1 & -3 \end{pmatrix} \quad \text{Determinant} = 1 \quad \text{Inverse} = \begin{pmatrix} 1 & 0 & 0 \\ -17 & -3 & -4 \\ 5 & 1 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 3 & 3 & -1 \\ -1 & -1 & 0 \\ -3 & -2 & 1 \end{pmatrix} \quad \text{Determinant} = 1 \quad \text{Inverse} = \begin{pmatrix} -1 & -1 & -1 \\ 1 & 0 & 1 \\ -1 & -3 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 1 \\ 4 & 1 & -3 \\ -1 & 0 & 0 \end{pmatrix} \quad \text{Determinant} = 1 \quad \text{Inverse} = \begin{pmatrix} 0 & 0 & -1 \\ 3 & 1 & 4 \\ 1 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & -1 & 1 \\ 1 & -1 & 3 \\ 1 & -1 & 4 \end{pmatrix} \quad \text{Determinant} = 1 \quad \text{Inverse} = \begin{pmatrix} -1 & 3 & -2 \\ -1 & -1 & 1 \\ 0 & -1 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 4 & -2 \\ 1 & 1 & -3 \\ 0 & 2 & 1 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} -7 & 8 & 10 \\ 1 & -1 & -1 \\ -2 & 2 & 3 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 1 & 3 \\ 2 & 0 & 3 \\ -3 & -1 & -1 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} -3 & 2 & -3 \\ 7 & -5 & 6 \\ 2 & -1 & 2 \end{pmatrix}$$

$$\begin{pmatrix} -1 & -1 & 3 \\ 1 & -1 & 4 \\ 0 & -1 & 3 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} -1 & 0 & 1 \\ 3 & 3 & -7 \\ 1 & 1 & -2 \end{pmatrix}$$

$$\begin{pmatrix} -1 & -1 & -2 \\ 0 & 1 & 3 \\ -1 & -1 & -3 \end{pmatrix} \quad \text{Determinant} = 1 \quad \text{Inverse} = \begin{pmatrix} 0 & -1 & -1 \\ -3 & 1 & 3 \\ 1 & 0 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -2 & 3 \\ -1 & 0 & 4 \\ 1 & -1 & 0 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} -4 & 3 & 8 \\ -4 & 3 & 7 \\ -1 & 1 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -2 & -1 \\ 1 & -3 & -3 \\ -1 & 2 & 2 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} 0 & -2 & -3 \\ -1 & -3 & -5 \\ 1 & 2 & 4 \end{pmatrix}$$

$$\begin{pmatrix} 2 & 3 & 1 \\ -1 & -3 & 3 \\ 1 & 1 & 2 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} 9 & 5 & -12 \\ -5 & -3 & 7 \\ -2 & -1 & 3 \end{pmatrix}$$

$$\begin{pmatrix} -1 & 1 & 1 \\ 1 & 0 & 2 \\ -1 & 0 & -1 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} 0 & -1 & -2 \\ 1 & -2 & -3 \\ 0 & 1 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 2 & -1 \\ 1 & 2 & 0 \\ 3 & 1 & 3 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} -6 & 7 & -2 \\ 3 & -3 & 1 \\ 5 & -6 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & 0 \\ -1 & -3 & 1 \\ -2 & 4 & 1 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} 7 & 1 & -1 \\ 1 & 0 & 0 \\ 10 & 2 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 2 \\ 0 & 2 & -1 \end{pmatrix} \quad \text{Determinant} = 1 \quad \text{Inverse} = \begin{pmatrix} -5 & 1 & 2 \\ 1 & 0 & 0 \\ 2 & 0 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -1 & 1 \\ 2 & 3 & 4 \\ -1 & 4 & 2 \end{pmatrix} \quad \text{Determinant} = -1 \quad \text{Inverse} = \begin{pmatrix} 10 & -6 & 7 \\ 8 & -5 & 6 \\ -11 & 7 & -8 \end{pmatrix}$$