1. Find $x$ and $y$ so that \[
\begin{pmatrix} 2x & 4 \\ -3 & x \end{pmatrix} + \begin{pmatrix} 3y & -2 \\ -2 & -y \end{pmatrix} = \begin{pmatrix} -5 & 2 \\ -5 & 10 \end{pmatrix}.
\]

(a) $x = 4, y = -14$
(b) $x = 5, y = -5$
(c) $x = 3, y = -11/3$
(d) $x = -5, y = -15$
(e) No solutions.

For problems 2 and 3, use the matrices $A = \begin{pmatrix} 2 & -1 & 3 \\ 0 & 4 & -2 \end{pmatrix}$, $B = \begin{pmatrix} -3 & 1 \\ 2 & 5 \end{pmatrix}$, $C = \begin{pmatrix} 3 & -2 \\ 0 & -1 \\ 1 & 2 \end{pmatrix}$.

2. If $D = AC - 4B$, then $d_{21} =$

(a) $-8$
(b) 6
(c) $-6$
(d) $-10$
(e) None of the above.

3. If $D = BAC$, then $d_{21} =$

(a) $d_{11}$ does not exist.
(b) $-6$
(c) 8
(d) 7
(e) None of the above.

4. Let $A = \begin{pmatrix} 1 & -3 \\ -2 & 4 \end{pmatrix}$. The element in the (1,2) position of $A^{-1}$ is:

(a) $3/2$
(b) 3
(c) $-3/2$
(d) $-1/2$
(e) None of the above.
5. Let \( A = \begin{pmatrix} 1 & -1 & -2 \\ 2 & -3 & -5 \\ -1 & 3 & 5 \end{pmatrix} \). The element in the (1,3) position of \( A^{-1} \) is:

(a) \( A^{-1} \) does not exist.
(b) 3
(c) −2
(d) 1
(e) None of the above.

6. Let \( A = \begin{pmatrix} 1 & 0 & 2 \\ -1 & 2 & -2 \\ 0 & 2 & 1 \end{pmatrix} \). The element in the (2,3) position of \( A^{-1} \) is:

(a) \( A^{-1} \) does not exist.
(b) 1
(c) −2
(d) 1/2
(e) None of the above.

7. The real numbers \( \lambda \) such that \( A = \begin{pmatrix} 2 & 1 & 6 \\ 0 & 1 & \lambda \\ \lambda & 0 & 4 \end{pmatrix} \) is singular are:

(a) \( \lambda = -2, 3 \)
(b) \( \lambda = -2, -4 \)
(c) \( \lambda = 2, 3 \)
(d) \( \lambda = 2, 4 \)
(e) None of the above.

8. The real numbers \( \lambda \) such that \( A = \begin{pmatrix} 0 & 1 & \lambda \\ \lambda & 0 & -2 \\ -1 & 1 & -2 \end{pmatrix} \) is nonsingular are:

(a) \( \lambda \neq -1, 3 \)
(b) \( \lambda \neq -1, -2 \)
(c) \( \lambda = -1 \)
(d) \( \lambda \neq 2, -2 \)
(e) All real numbers.
9. Given the system of equations
\[\begin{align*}
  x + 3y + z &= -2 \\
  2x + 5y + z &= -5 \\
  x + 2y + 3z &= 1
\end{align*}\]

The determinant of the matrix of coefficients is \(-3\). The value of \(z\) in the solution set is:

(a) \(z = -2/3\)
(b) \(z = 5/3\)
(c) \(z = 4/3\)
(d) \(z = -2\)
(e) None of the above.

10. Given the system of equations
\[\begin{align*}
  8x - 2y + z &= 1 \\
  2x - y + 6z &= 3 \\
  6x + y + 4z &= 3
\end{align*}\]

The value of \(x\) in the solution set is:

(a) \(x = 2\)
(b) \(x = 1/2\)
(c) \(x = -1/4\)
(d) \(x = 1/8\)
(e) None of the above.

11. The values of \(\lambda\) for which the system
\[\begin{align*}
  (1 - \lambda)x - 3y &= 0 \\
  -4x + (2 - \lambda)y &= 0
\end{align*}\]

has only the trivial solution are:

(a) All real numbers.
(b) \(\lambda \neq 5, -2\)
(c) \(\lambda \neq -5, 2\)
(d) \(\lambda \neq 6, -2\)
(e) None of the above.
12. If a system of $n$ linear equations in $n$ unknowns is inconsistent, then the rank of the matrix of coefficients is $n - 1$.

(a) Always true
(b) Sometimes true
(c) Never true,
(d) None of the above

13. If the matrix of coefficients of a system of $n$ linear equations in $n$ unknowns is singular, then the system has infinitely many solutions.

(a) Always true
(b) Occasionally true
(c) Never true,
(d) None of the above

14. If the reduced row echelon form of the matrix of coefficients of a system of $n$ linear equations in $n$ unknowns is not the identity matrix, then the determinant of the matrix of coefficients is non-zero.

(a) Always true
(b) Sometimes true
(c) Sometimes false.
(d) Always false.
(e) None of the above

15. If a system of $n$ linear equations in $n$ unknowns is dependent, then the matrix of coefficients has rank less than $n$.

(a) Always true
(b) Sometimes true
(c) Occasionally false.
(d) Always false.
(e) None of the above