1. The solution set of the system
\[
\begin{align*}
3x + 6y - 3z &= 6 \\
-2x - 4y - 3z &= -1 \\
3x + 6y - 2z &= 10
\end{align*}
\]
is:

(a) \( x = 7 - a, \ y = 2 + a, \ z = a, \ \ a \ \text{any real number} \).
(b) \( x = 3 - 2a, \ y = 4a - 1, \ z = a, \ \ a \ \text{any real number} \).
\( \text{\textcolor{green}{\bullet}} \) no solution
(d) \( x = 4, \ y = -2, \ z = -1 \).
(e) None of the above.

\[
\begin{align*}
x + 2y - 3z + 4w &= 2
\end{align*}
\]

2. The solution set of the system
\[
\begin{align*}
2x + 5y - 2z + w &= 1 \\
5x + 12y - 7z + 7w &= 4
\end{align*}
\]
is:

(a) no solutions
(b) \( x = -8 + 11a, \ y = 2 - 4a, \ z = a, \ w = a, \ \ a \ \text{any real number} \).
\( \text{\textcolor{green}{\bullet}} \) \( x = 8 + 11a, \ y = -3 - 4a, \ z = a, \ w = 0, \ \ a \ \text{any real number} \).
(d) \( x = 8 + a, \ y = -3 + 4a, \ z = 1, \ w = a, \ \ a \ \text{any real number} \).
(e) None of the above.

\[
\begin{align*}
2x + 8y + 11z &= 7
\end{align*}
\]

3. The solution set of the system
\[
\begin{align*}
x + 4y + 3z &= 1 \\
x + 6y + 7z &= 3
\end{align*}
\]
is:

(a) \( x = 1, \ y = -1, \ z = 2 \)
(b) no solution
(c) \( x = 2 - a, \ y = -3 - 2a, \ z = a, \ \ a \ \text{any real number} \).
\( \text{\textcolor{green}{\bullet}} \) \( x = 2, \ y = -1, \ z = 1 \).
(e) None of the above.
4. The solution set of the system
\[
\begin{align*}
x + y - 2z + 3w &= 4 \\
2x + 3y + 3z - w &= 3 \\
5x + 7y + 4z + w &= 5
\end{align*}
\]
is:

- (a) no solutions
- (b) \(x = 9 + 9a - 10b, \ y = -5 - 7a + 7w, \ z = a, \ w = b, \ a, \ b \text{ any real numbers}\)
- (c) \(x = 8 + 11a, \ y = -3 - 4a, \ z = a, \ w = 0, \ a \text{ any real number}\)
- (d) \(x = 9 + 9a, \ y = -5 - 7a, \ z = a, \ w = 0, \ a \text{ any real numbers}\)
- (e) None of the above.

Use the system of equations
\[
\begin{align*}
x - 2y &= 1 \\
x - y + kz &= -2 \\
ky + 4z &= 6
\end{align*}
\]
for problems 5 and 6.

5. The value(s) of \(k\) such that the system has a unique solution is (are):

- (a) \(k \neq \pm 3\)
- (b) \(k \neq \pm 2\)
- (c) \(k \neq -2\)
- (d) \(k = 2, \ -2\)
- (e) None of the above.

6. The value(s) of \(k\) such that the system has no solutions is (are):

- (a) \(k \neq 2\)
- (b) \(k = -2\)
- (c) \(k = 2\)
- (d) \(k \neq -2\)
- (e) None of the above.

Use the system of equations
\[
\begin{align*}
x + 2y + 3z &= 4 \\
y + 5z &= 9 \\
2x + 3y + (k^2 - 8)z &= k + 2
\end{align*}
\]
for problems 7 and 8.

7. The value(s) of \(k\) such that the system has infinitely many solutions is (are):

- (a) \(k \neq 3\)
- (b) \(k \neq -3\)
- (c) \(k = 3\)
- (d) \(k = -3\)
- (e) None of the above.
8. The value(s) of $k$ such that the system has a unique solution is (are):
   (a) $k = 3$
   (b) $k = -3$
   (c) $k \neq \pm 3$
   (d) $k = 3, -3$
   (e) None of the above.

9. The reduced row echelon form of
   \[
   \begin{pmatrix}
   2 & 2 & -2 & 6 & 4 \\
   4 & 4 & -3 & 10 & 13 \\
   6 & 6 & -6 & 19 & 14
   \end{pmatrix}
   \]
   is
   (a) \[
   \begin{pmatrix}
   1 & 1 & -1 & 3 & 2 \\
   0 & 0 & 1 & -2 & 5 \\
   0 & 0 & 0 & 1 & -2
   \end{pmatrix}
   \]
   (b) \[
   \begin{pmatrix}
   1 & 1 & 0 & 0 & 5 \\
   0 & 0 & 1 & 0 & 9 \\
   0 & 0 & 0 & 1 & 2
   \end{pmatrix}
   \]
   (c) \[
   \begin{pmatrix}
   1 & 1 & 0 & 0 & -4 \\
   0 & 0 & 1 & 0 & -2 \\
   0 & 0 & 0 & 1 & -1
   \end{pmatrix}
   \]
   (d) \[
   \begin{pmatrix}
   1 & 1 & 0 & 0 & 8 \\
   0 & 0 & 1 & 0 & 9 \\
   0 & 0 & 1 & 0 & 2
   \end{pmatrix}
   \]
   (e) None of the above.

10. The reduced row echelon form of
    \[
    \begin{pmatrix}
    2 & 7 & -3 & 7 & -5 \\
    1 & 3 & -2 & 5 & -3 \\
    3 & 11 & -4 & 10 & -9
    \end{pmatrix}
    \]
    is
    (a) \[
    \begin{pmatrix}
    1 & 3 & -2 & 5 & -3 \\
    0 & 1 & 1 & -3 & 1 \\
    0 & 0 & 0 & 1 & -2
    \end{pmatrix}
    \]
    (b) \[
    \begin{pmatrix}
    1 & 3 & 0 & 0 & 7 \\
    0 & 1 & 1 & 0 & -5 \\
    0 & 0 & 0 & 1 & -2
    \end{pmatrix}
    \]
    (c) \[
    \begin{pmatrix}
    1 & 0 & -5 & 0 & 22 \\
    0 & 1 & 1 & 0 & -5 \\
    0 & 0 & 0 & 1 & -2
    \end{pmatrix}
    \]
    (d) \[
    \begin{pmatrix}
    1 & 3 & -2 & 5 & -3 \\
    0 & 1 & 1 & -3 & 1 \\
    0 & 0 & 0 & 1 & -2
    \end{pmatrix}
    \]
    (e) None of the above.
11. The system of equations
\[\begin{align*}
x + 2y &= 3 \\
2x + 5y - z &= -4 \\
3x - 2y - z &= 5
\end{align*}\]

is:
- (a) consistent and independent.
- (b) consistent and dependent.
- (c) inconsistent.
- (d) incorrigible.
- (e) None of the above.

12. The system of equations
\[\begin{align*}
x + 2y - 2z &= -1 \\
3x - y + 2z &= 7 \\
5x + 3y - 2z &= 2
\end{align*}\]

is:
- (a) consistent and independent.
- (b) consistent and dependent.
- ☒ inconsistent.
- (d) deplorable.
- (e) None of the above.

13. The ranks of the augmented matrix and the matrix of coefficients of the system of equations
\[\begin{align*}
x + 2y - 3z &= 1 \\
2x + 5y - 8z &= 4 \\
3x + 8y - 13z &= 7
\end{align*}\]

are, respectively,
- (a) 3, 3
- (b) 2, 3
- ☒ 2, 2
- (d) 3, 2
- (e) None of the above.
14. The ranks of the augmented matrix and the matrix of coefficients of the system of equations

\[
\begin{align*}
3x - y + 2z &= 7 \\
x + 2y - 3z &= -1 \\
5x + 3y - 4z &= 2
\end{align*}
\]

are, respectively,

(a) 3, 3  
(b) 2, 3  
(c) 2, 2  
\[\text{3, 2}\]  
(e) None of the above.

15. The systems of equations in Problem in 14 has

(a) a unique solution.  
(b) infinitely many solutions.  
\[\text{no solution.}\]  
(d) a plethora of solutions.  
(e) None of the above.