1. Solve the system by elimination.

   \[4x + 3y = 14\]
   \[12x - 7y = 74\]

2. Write an augmented matrix for the system of equations, and give its size.

   \[9x - 6y + 9z + 1 = 0\]
   \[7x - 5y + 4z - 9 = 0\]
   \[3y - 4z + 7 = 0\]

   What is the augmented matrix?

   \[
   \begin{bmatrix}
   \square & \square & \square & \square \\
   \square & \square & \square & \square \\
   \square & \square & \square & \square \\
   \square & \square & \square & \square \\
   \end{bmatrix}
   \]

   What is the size of the matrix?
   \(\bigcirc\text{A. } 3 \times 4\) \(\bigcirc\text{B. } 3 \times 3\) \(\bigcirc\text{C. } 4 \times 3\) \(\bigcirc\text{D. } 4 \times 4\)

3. Solve the system by substitution.

   \[3x + 4y = -7 \quad (1)\]
   \[-x + y = 7 \quad (2)\]

4. The sum of two numbers is 56, and the difference between the numbers is 2. Find the numbers.
5. Use the specified row transformation to change the matrix.

3 times row 1 added to row 2

What is the transformed matrix?

\[
\begin{bmatrix}
1 & 2 & 9 \\
8 & 7 & 0 \\
\end{bmatrix}
\]

6. Use the Gauss-Jordan method to solve the system of equations. If the system has infinitely many solutions, give the solution with z arbitrary.

\[
\begin{align*}
x + y - 3z &= -19 \\
3x - 3y + 4z &= 7 \\
x + 3y - 5z &= -31
\end{align*}
\]

7. Find the value of the determinant.

The determinant value is \( \underline{\boxed{\text{.}}} \).

(Simplify your answer.)

[\begin{vmatrix}
-1 & 6 \\
4 & -2
\end{vmatrix}]

8. Evaluate the determinant by expanding about any row or column.

The determinant is \( \underline{\boxed{\text{.}}} \).
9. Find the value of the determinant.
\[
\begin{vmatrix}
-2 & 0 & 9 \\
0 & 1 & 0 \\
0 & 0 & -1 \\
\end{vmatrix}
\]

10. Solve the equation for \( x \).
\[
\begin{vmatrix}
5x & x \\
33 & x \\
\end{vmatrix} = 14
\]

11. Use Cramer's Rule to solve the system of equations. If \( D = 0 \), use another method to determine the solution set.
\[
x + y = 6 \\
x - y = 4
\]

12. Use Cramer's rule to solve the system of equations. If \( D = 0 \), use another method to determine the solution set.
\[
2x + 7y = 5 \\
4x + 14y = -1
\]
13. Find the partial fraction decomposition for the rational expression.

\[ \frac{15}{2x(3x + 5)} \]

14. Find the partial fraction decomposition for the rational expression.

\[ \frac{2x + 1}{(x + 1)^3} \]

15. Find the partial fraction decomposition for the rational expression.

\[ \frac{-3}{x^2(x^2 + 7)} \]

16. Find the partial fraction decomposition for the rational expression.

\[ \frac{5x - 1}{(x + 8)(4x^2 + 1)} \]
17. A nonlinear system is given below, and the graphs of both equations in the system is shown to the right. Verify that the points of intersection specified on the graph are solutions of the system by substituting directly into both equations.

\[ x^2 = y - 1 \]
\[ y = 2x + 9 \]

Verify for the point (4, 17). First, substitute directly for x and y into both equations.

\[ x^2 = y - 1 \quad \rightarrow \quad (\underline{4})^2 = \underline{17} - 1 \]
\[ y = 2x + 9 \quad \rightarrow \quad \underline{17} = 2(\underline{4}) + 9 \]

Simplify each side of both resultant equations. Does the solution check?

- No
- Yes

Verify for the point (−2, 5). First, substitute directly for x and y into both equations.

\[ x^2 = y - 1 \quad \rightarrow \quad (\underline{-2})^2 = \underline{5} - 1 \]
\[ y = 2x + 9 \quad \rightarrow \quad \underline{5} = 2(\underline{-2}) + 9 \]

Simplify each side of both resultant equations. Does the solution check?

- No
- Yes
18. A nonlinear system is given, along with the graphs of both equations in the system. Verify that the points of intersection specified on the graph are solutions of the system by substituting directly into both equations.

Substitute the coordinates of the point \((-3, -2)\) into the left side of the first equation.

\[x^2 + y^2 = \square\]

Substitute the coordinates of the point \((-3, -2)\) into the left side of the second equation.

\[16x - 32y = \square\]

Substitute the coordinates of the point \(\left(\frac{17}{5}, \frac{6}{5}\right)\) into the left side of the first equation.

\[x^2 + y^2 = \square\]

Substitute the coordinates of the point \(\left(\frac{17}{5}, \frac{6}{5}\right)\) into the left side of the second equation.

\[16x - 32y = \square\]

Are the points of intersection specified on the graph the solutions of the system?

- [ ] Yes
- [ ] No
19. How can we tell, before doing any work, that the below system cannot have more than two solutions?

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

Choose the correct choice below.

A. Given system consist two variables x and y.
B. Consider the graphs; a line and a parabola cannot intersect in more than two points.
C. Given system consist two equations.
D. Consider the graphs; a line and a parabola intersects at only one point.

20. Give all solutions of the nonlinear system of equations, including those with nonreal complex components.

\[
\begin{align*}
  3x^2 + 2y^2 &= 18 \\
  x - y &= -3
\end{align*}
\]

21. Give all solutions of the nonlinear system of equations, including those with nonreal complex components.

\[
\begin{align*}
  x^2 + y^2 &= 16 \\
  |x| - y &= 4
\end{align*}
\]
22. Find the equation of the line passing through the points of intersection of the graphs of \( y = x^2 \) and \( x^2 + y^2 = 90 \).

The equation of the line is \( \square \).

23. Write the first five terms of the sequence whose general term, \( a_n \), is given as \( a_n = (-1)^n (-5n) \).

\[ a_1 = \square \]
\[ a_2 = \square \]
\[ a_3 = \square \]
\[ a_4 = \square \]
\[ a_5 = \square \]

24. Decide whether the sequence 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, \ldots is finite or infinite.

Choose the correct answer below.

- [ ] Finite
- [ ] Infinite
25. Write the first 4 terms of the sequence.

\[ a_1 = 5, \quad a_n = -a_{n-1} + 8, \quad \text{for } n > 1 \]

What is the first term?

\[ a_1 = \Box \]

What is the second term?

\[ a_2 = \Box \]

What is the third term?

\[ a_3 = \Box \]

What is the fourth term?

\[ a_4 = \Box \]

26. Evaluate the series.

\[ \sum_{i=1}^{7} (2i + 5) \]

27. Use the summation properties and rules to evaluate the series.

\[ \sum_{j=1}^{90} 5 \]

28. Use summation notation to write the series.

\[ \frac{1}{3(1)} + \frac{1}{3(2)} + \frac{1}{3(3)} + \cdots + \frac{1}{3(9)} \]

The summation notation for the series is \[ \sum_{i=1}^{\Box} \Box \].
29. Use summation notation to write the series.

\[ 1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \cdots - \frac{1}{512} \]

The summation notation for the series is \( \sum_{i=1}^{\text{[Blank]}} \) \( \text{[Blank]} \). (Simplify your answers.)

30. Find the common difference \( d \) for the arithmetic sequence.

7, 1, −5, −11, ...

d = \[ \text{[Blank]} \]

31. Find the first four terms of the arithmetic sequence.

\( a_1 = -6, d = 5 \)

What is the first term?

\( a_1 = \[ \text{[Blank]} \] \)

What is the second term?

\( a_2 = \[ \text{[Blank]} \] \)

What is the third term?

\( a_3 = \[ \text{[Blank]} \] \)

What is the fourth term?

\( a_4 = \[ \text{[Blank]} \] \)

32. Find \( a_5 \) and \( a_n \) for the arithmetic sequence.

\( a_1 = x, a_2 = x + 1 \)

\( a_5 = \[ \text{[Blank]} \] \)

\( a_n = \[ \text{[Blank]} \] \)
33. Find the sum of the first 82 terms of the arithmetic sequence.

24, 34, 44, 54, ...

34. Find the sum of the first 162 natural numbers.

35. Find the sum of this arithmetic series.

\[ \sum_{i=1}^{350} i \]

36. Find the sum of all integers from 59 to 97.

37. Find \(a_n\) and \(a_5\) for the following geometric sequence.

\(a_1 = 4, r = -2\)

\[ a_n = (\square)^{n-1} \]

\[ a_5 = \square \]

38. Find \(a_5\) and \(a_n\) for the following geometric sequence.

18, -9, \(\frac{9}{2}\), -\(\frac{9}{4}\), ...

\[ a_5 = \square \]

\[ a_n = \square \]

39. Use the formula for \(S_n\) to find the sum of the first five terms of the geometric sequence.

6, -2, \(\frac{2}{3}\), -\(\frac{2}{9}\), ...
40. Find the sum.

\[ \sum_{j=1}^{4} 72 \left( \frac{1}{3} \right)^j \]

41. Find the sum that converges.

\[ \sum_{k=1}^{\infty} 8^{-k} \]

42. Find the sum, if it converges.

\[ \sum_{i=1}^{\infty} \left( \frac{2}{3} \right)^i \]

43. Find \( r \) for the infinite geometric sequence. Determine whether the sum will converge.

4, 12, 36, 108, ...

\[ r = \square \]

(Type an integer or a simplified fraction.)

Will the sum converge?

○ No
○ Yes
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(5, -2)</td>
</tr>
</tbody>
</table>
| 2. | 9  
|    | -6  
|    | 9  
|    | -1  
|    | 7   
|    | -5  
|    | 4   
|    | 9   
|    | 0   
|    | 3   
|    | -4  
|    | -7  
|    | A   |
| 3. | (-5,2) |
| 4. | 29,27 |
| 5. | 0    
|    | 12   
|    | 26   |
| 6. | A, -5, -2, 4 |
| 7. | -22  |
| 8. | 0    |
| 9. | 2    |
| 10. | $\frac{-2}{5}$, 7 |
| 11. | A, (5,1) |
12. C

13. \[ \frac{3}{2} \]

14. \[ \frac{2}{(x+1)^2} + \frac{-1}{(x+1)^3} \]

15. \[ -\frac{3}{7x^2} + \frac{3}{7(x^2 + 7)} \]

16. \[ -\frac{41}{257(x+8)} + \frac{164x - 27}{257(4x^2 + 1)} \]

17. 4
   17
   17
   4
   Yes
   -2
   5
   5
   -2
   Yes

18. 13
   16
   13
   16
   Yes

19. B

20. A, (0,3), \left( -\frac{12}{5}, \frac{3}{5} \right)

21. A, (4,0), (-4,0), (0, -4)

22. \[ y = 9 \]
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 23. | 5  
   |   − 10  
   | 15  
   |   − 20  
   | 25  |
| 24. | Infinite  |
| 25. | 5  
   |   3  
   | 5  
   |   3  |
| 26. | 91  |
| 27. | 450  |
| 28. | \frac{9}{3i}  |
| 29. | \left( \frac{-1}{2} \right)^{-1}  |
| 30. | -6  |
| 31. | -6  
   |   -1  
   | 4  
   |   9  |
| 32. | x + 4  
<p>| x + 1n - 1  |
| 33. | 35,178  |
| 34. | 13203  |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35.</td>
<td>61425</td>
</tr>
<tr>
<td>36.</td>
<td>3042</td>
</tr>
</tbody>
</table>
| 37. | \[
|   | \frac{4}{-2} & 64 \\
| 38. | \[
|   | \frac{9}{8} & 18 \left(-\frac{1}{2}\right)^{n-1} \\
| 39. | \frac{122}{27} |
| 40. | \frac{320}{9} |
| 41. | \frac{1}{7} |
| 42. | 2 |
| 43. | \frac{3}{No} |