Solve the following equations:

1. \( \frac{6}{y+3} + \frac{2}{y} = \frac{5y-3}{y^2-9} \)
2. \( \sqrt{2x+5} + 5 = x \)
3. \( |x - 4| + 3 = 9 \)
4. \( (x^2 - x)^2 - 14(x^2 - x) + 24 = 0 \)
5. \( (x - 5)^2 = -25 \)
6. \( 5^{x+2} = 4^{1-x} \)
7. \( \log{x} + \log(x - 9) = 1 \)
8. \( \log_3(x + 14) + \log_3(x + 6) = \log_3{x} \)

9. Solve the quadratic equation \( 2x^2 - 5x - 9 = 0 \) by completing the square.

10. Rewrite the complex number \( \frac{6 + 5i}{7 - 2i} \) in standard form \( a + bi \).

In problems 11-13, solve the Linear and Absolute Value Inequalities and express the solution using interval notation:

11. \( \frac{x-4}{6} < \frac{x-2}{9} + \frac{5}{18} \)
12. \( |2x - 1| > 7 \)
13. \( |x + 5| \leq 12 \)

In problems 14 & 15, solve the Polynomial and Rational Inequality. Express the solution using interval notation.

14. \( x^2 - 4x - 17 \geq 4 \)
15. \( \frac{x}{x+4} < 2 \)

In problems 16 & 17, state the domain and range of the function whose graph is given.

16. 

17. 
18. State the open intervals where the function is decreasing or increasing.

In problems 19-21, determine the slope-intercept form of each line.

19. The line through the points \((-1,3)\) and \((4,-7)\).

20. The line through the point \((-2,5)\) and parallel to the line \(3x - 5y = 10\).

21. The line through the point \((3,7)\) and perpendicular to the line \(2x + 3y = 9\).

22. The average weight of American adults has been gradually increasing. In 1990, the average weight of an American adult was 168 lb and in 2000 the average weight increased to 173 pounds.
   a) Find the equation of the linear function which models the average weight of adult Americans \(x\)-years after 1990.
   b) Use the function to predict the average weight in 2015.
   c) In what year will the average weight be 200 pounds?

23. If \(f(x) = 3x^2 + 7x - 9\), find and simplify the difference quotient \(\frac{f(x+h)-f(x)}{h}\).

24. Given \(f(x) = \frac{2x+1}{3x+5}\) and \(g(x) = \frac{x+7}{x-3}\). Find the composite function \(f(g(x))\).

25. Graph the piecewise-defined function \(f(x) = \begin{cases} 2x + 1 & \text{if } x \leq -2 \\ -x + 3 & \text{if } x > -2 \end{cases}\)

26. Determine the equation for the inverse of the one-to-one function \(f(x) = \frac{2x+1}{x-5}\).

27. Completely expand the expression \(\log_b \sqrt[4]{\frac{m^n n^{1/2}}{z^3 w^5}}\).
Solve the following system of linear equations:

28. \[ \begin{align*}
4x + 5y &= 21 \\
5x + 6y &= 42
\end{align*} \]

29. \[ \begin{align*}
x + 2y - z &= 6 \\
2x - y + 3z &= -13 \\
3x - 2y + 3z &= -16
\end{align*} \]

Solve the following systems of linear equations using matrices and row reduction. If the system is dependent, find its general solution.

30. \[ \begin{align*}
x + 5 - z &= 2 \\
2x + y + z &= 7 \\
x - y + 2z &= 11
\end{align*} \]

31. \[ \begin{align*}
x + 5y + 3z &= 2 \\
3x + 2y + 2z &= 2 \\
2x - 3y - z &= 0
\end{align*} \]

32. Evaluate the determinant: \[
\begin{vmatrix}
5 & 3 & 9 \\
-7 & 6 & 2 \\
4 & -8 & 1
\end{vmatrix}
\]

In all the following application problems, you may use a calculator to solve each system.

33. A restaurant manager wants to purchase 200 sets of dishes. One design costs $25 per set, while the other costs $45 per set. If she wants to spend exactly $7400, how many of each design should be ordered?

34. A cookie company makes three kinds of cookies; oatmeal raisin, chocolate chip, and shortbread, packaged in small medium and large boxes. The small box contains 1 dozen oatmeal raisin and 1 dozen chocolate chip; the medium box has 2 dozen oatmeal raisin, 1 dozen chocolate chip, and 1 dozen shortbread; the large box contains 2 dozen oatmeal raisin, 2 dozen chocolate chip, and 3 dozen shortbread. If you require exactly 15 dozen oatmeal raisin, 10 dozen chocolate chip, and 11 dozen shortbread, how many of each size box should you buy?

35. Graph the ellipse: \[ \frac{(x-3)^2}{9} + \frac{(y+1)^2}{25} = 1 \]

36. Graph the hyperbola: \[ \frac{(x+2)^2}{9} - \frac{(y-4)^2}{36} = 1 \]