Rationals

1) For what value(s) of \( x \) is \( \frac{4x - 5}{x^2 - 49} \) undefined?
   
   A) +7 and -7  
   B) 0, +7, and -7  
   C) 0, only  
   D) +7, only

2) For all values of \( z \) for which the expression is defined, the expression \( \frac{3z^2 - 12z}{4z^2 - z^3} \) is equivalent to
   
   A) \(-\frac{3}{4z}\)  
   B) \(-\frac{3}{z}\)  
   C) \(\frac{3}{z}\)  
   D) \(\frac{3}{4} - \frac{12}{z^2}\)

3) Simplify: \( \frac{x^{-1} - 1}{x - 1} \)
   
   A) -x  
   B) \(\frac{1}{x}\)  
   C) \(\frac{1}{x^2}\)  
   D) \(-\frac{1}{x}\)

4) As a fraction in lowest terms when \( b \neq 1 \), the expression \( \frac{6}{b - 1} \cdot \frac{5 - 5b}{10} \) is equivalent to
   
   A) \(3(b - 1)\)  
   B) \(\frac{3}{5}(1 - b)\)  
   C) -3  
   D) \(-\frac{1}{3}\)

5) The fraction \( \frac{1 + \frac{1}{x}}{1 - \frac{1}{x^2}} \) is equivalent to
   
   A) \(\frac{x}{x + 1}\)  
   B) -x  
   C) \(\frac{x}{x - 1}\)  
   D) \(\frac{x}{x}\)

6) The expression \( \frac{6}{a - 5} - \frac{a + 5}{a^2 - 25} \) is equivalent to
   
   A) \(\frac{5}{a - 5}\)  
   B) \(\frac{5a}{a + 5}\)  
   C) \(\frac{5}{a + 5}\)  
   D) \(\frac{5a}{a - 5}\)

7) For all values of \( x \) for which the expression is defined, the expression \( \frac{2x + x^2}{x^2 + 5x + 6} \) is equivalent to
   
   A) \(\frac{1}{x + 3}\)  
   B) \(\frac{x}{x + 3}\)  
   C) \(\frac{1}{x + 2}\)  
   D) \(\frac{x}{x + 2}\)

8) What expression is equivalent to \( \frac{9 - x^2}{x^2} \) divided by \( \frac{3 + x}{x^3} \) when \( x \neq -3, 0 \)?
   
   A) \(\frac{3 - x}{x}\)  
   B) \(x(x - 3)\)  
   C) \(\frac{x - 3}{x}\)  
   D) \(x(3 - x)\)

9) The expression \( \frac{x}{x - 1} + \frac{x}{x + 1} \) is equivalent to
   
   A) \(\frac{2x}{x^2 - 1}\)  
   B) \(-2\)  
   C) \(\frac{2x^2}{x^2 - 1}\)  
   D) \(1\)

10) If the length of a rectangular field is represented by the expression \( \frac{3a + a^2}{a^2 - 9} \), and the width is represented by \( \frac{a^2 + a - 12}{a + 4} \), which expression represents the area of the field?
    
    A) \(a\)  
    B) \(a^2\)  
    C) 1  
    D) \((a + 3)(a + 4)\)
11) What is the quotient when \( \frac{5}{x - 3} \) is divided by \( \frac{5}{x} \)?

A) \( \frac{x - 3}{x} \)  
B) \( \frac{-1}{3} \)  
C) \( \frac{x}{x - 3} \)  
D) \( \frac{-x}{x + 3} \)

12) What is the solution set of \( \frac{3x + 2}{3x + 2} = \frac{x + 4}{2x + 9} \)?

A) \{ -5 \}, only  
B) \{ \}  
C) \{ 5 \}, only  
D) \{ -5, 5 \}

13) Simplify: \( \frac{1}{m^{-1} + n^{-1}} \)

A) \( \frac{m + n}{mn} \)  
B) \( \frac{mn}{m + n} \)  
C) \( m + n \)  
D) \( \frac{m + n}{mn} \)

14) What is the sum of \( \frac{3}{x - 3} \) and \( \frac{x}{3 - x} \)?

A) \(-1\)  
B) \(0\)  
C) \(\frac{x + 3}{x - 3}\)  
D) \(1\)

15) Expressed in simplest form, \( \frac{n - 1}{n + 1} \) is equivalent to

A) \( n \)  
B) \( \frac{n - 1}{n + 1} \)  
C) \( n + 1 \)  
D) \( n - 1 \)

16) What is the solution set of the equation \( \frac{x}{x - 4} - \frac{1}{x + 3} = \frac{28}{x^2 - x - 12} \)?

A) \{ 4, -6 \}  
B) \{ -6 \}  
C) \{ \}  
D) \{ 4 \}

17) If the length of a rectangular garden is represented by \( \frac{x^2 + 2x}{x^2 + 2x - 15} \) and its width is represented by \( \frac{2x - 6}{2x + 4} \), what is an expression that represents the area of the garden?

18) Express \( \frac{3a + 1}{a^2 - 1} - \frac{1}{a + 1} \) as a single fraction in simplest form.

19) What is the quotient when \( 6x^2 + 7x + 2 \) is divided by \( 2x + 1 \)?

20) Solve for \( x \):

\[
\frac{5}{x - 3} - \frac{30}{x^2 - 9} = 1
\]

21) What is \( \frac{1}{x} + \frac{1}{1 - x} \), \( x \neq 1, 0 \), expressed as a single fraction?
22) What is the result when the terms in the expression \( \frac{b + 2}{b^2 - 9} \cdot \frac{4b + 12}{3b + 6} + \frac{8}{2b - 6} \) are combined and simplified?

23) Express \( \frac{1}{x} + \frac{1}{x + 3} \) as a single fraction in simplest form.

24) Solve for \( x \):
\[
\frac{x}{x - 2} - \frac{8}{x + 3} = \frac{10}{x^2 + x - 6}
\]

25) Perform the indicated operations and simplify:
\[
\frac{x^2 - 9}{x^2 - 5x} \cdot \frac{5x - x^2}{x^2 - x - 12} \cdot \frac{x - 4}{x^2 - 8x + 16}
\]

26) Simplify:
\[
\frac{2}{b} + \frac{b}{2} \frac{1}{2b}
\]

27) The area of a rectangular deck is \( \frac{x^2 - 3x}{2x^2 + x - 6} \) and its length is \( \frac{x^2 - 5x + 6}{x^2 - 4} \). What is an expression that represents the width of the deck?

28) Solve for \( x \):
\[
\frac{1}{x - 1} + \frac{2}{x^2 - 1} = \frac{8}{x + 1}
\]

29) Simplify:
\[
\frac{25 - a^2}{a^3} + \frac{5 - a}{a}
\]
30) Solve: \( \frac{3}{x} - 2 = \frac{-2x}{x + 1} \)

31) Simplify: \( \frac{c^2 - 1}{3c - 9} \cdot \frac{c^2 - 8c + 15}{4c + 4} + \frac{c^2 - 6c + 5}{6c^2} \)

32) Simplify: \( \frac{2x^2 - x - 1}{2x^2 + x - 3} \cdot \frac{2x^2 + 5x + 3}{2x^2 - x - 1} \)

33) Simplify: \( \frac{x^2 - 25}{2x + 12} \cdot \frac{x^2 + 8x + 12}{4x - 20} + \frac{x^2 + 7x + 10}{8x} \)

34) Express \( \frac{3x - 9}{x^2 - 9} - \frac{1}{x + 3} \) as a single fraction in simplest form.

35) Solve for \( x \): \( \frac{9}{x} + \frac{9}{x - 2} = 12 \)

Inequalities

36) The bi-weekly income of an employee at a local bank differs from \$950 by no more than \$75. If \( x \) represents the bi-weekly income, which of the following statements best expresses this relationship?

A) \( |x - 950| \leq 75 \)  
B) \( |x - 950| \geq 75 \)  
C) \( |x - 75| \leq 950 \)  
D) \( |2x - 950| \geq 75 \)

37) Which graph represents the solution set of \( |x + 1| < 2 \)?

A) \[
\begin{array}{cccccccc}
-6 & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\end{array}
\]

B) \[
\begin{array}{cccccccc}
-6 & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\end{array}
\]

C) \[
\begin{array}{cccccccc}
-6 & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\end{array}
\]

D) \[
\begin{array}{cccccccc}
-6 & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\end{array}
\]
38) The accompanying graph represents a solution to which of the following inequalities?

\[ y - 3 > -(x + 2)^2 \]
\[ y + 3 < -(x - 2)^2 \]
\[ y - 3 > -(x + 2)^2 \]
\[ y - 3 < -(x - 2)^2 \]

42) The solution set of the inequality \( \frac{x^2 - x}{x^2 + 2x} \leq 0 \) is

A) \( \{x | -2 < x < 0 \text{ or } 0 < x \leq 1\} \)
B) \( \{x | -2 \leq x \leq 1\} \)
C) \( \{x | x < -2 \text{ or } x > 1\} \)
D) \( \{x | 0 < x \leq 1\} \)

43) Which of the following represents the solution set for the inequality \( \frac{x - 4}{x} > 0 \)?

A) \[
\begin{array}{cccccccc}
-5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\end{array}
\]
B) \[
\begin{array}{cccccccc}
-5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\end{array}
\]
C) \[
\begin{array}{cccccccc}
-5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\end{array}
\]
D) \[
\begin{array}{cccccccc}
-5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\end{array}
\]

44) Solve for \( x \): \( x^2 - 2x \geq 0 \)

45) The solution for the inequality \( |3x - 2| < 4 \) is
46) What is the solution set of the inequality \( \frac{2x + 3}{x} \geq x? \)

47) Solve for \( x \): \( x^2 < 4x - 3 \)

48) What is the solution set for \( |3 - 2x| \geq 4? \)

Questions 49 and 50 refer to the following:

Solve the given inequality algebraically and sketch a graph of the solution set on the number line provided.

49) \( \frac{x + 6}{x + 1} \geq 0 \)

50) \( \frac{3}{x - 4} \geq \frac{2}{x} \)