Name ________________________________

1. Simplify completely:
   (a) \( \frac{3}{3z^3} \cdot \sqrt[3]{81x^9y^{-10}z^6} \)
   (b) \( 3^{-1} \cdot (2\frac{1}{2} + 2\frac{3}{2})^2 \)
   (c) \(-3^2 + (-3)^2 + 3^{-2} \)
   (d) \( \frac{16\frac{3}{2} + 9^{-\frac{1}{2}}}{16\frac{3}{2} - 9^{-\frac{1}{2}}} \)

2. Factor the following:
   (a) \( 4x^2 - 25 \)
   (b) \( 2x^2 + 5x - 12 \)
   (c) \( x^3 - 3x^2 - 4x + 12 \)
   (d) \( x^2y - 3xy^2 \)

3. Simplify
   (a) \( \frac{2x^2 + x - 1}{x^2 - 4} \cdot \frac{x + 2}{2x - 1} \)
   (b) \( \frac{x^2 + 2x - 5}{x^2 - x - 6} \cdot \frac{x - 1}{x - 3} \)

4. Solve (find only the real solutions)
   (a) \( x^2 + x = 12 \)
   (b) \( x^4 - 3x^2 + 2 = 0 \)
   (c) \( x^4 + 10x^2 = 6x^3 \)
   (d) \( \frac{2x}{x + 1} = \frac{2x - 1}{x} \)
   (e) \( 3 - \left| \frac{2x + 5}{3} \right| = 5 \)
   (f) \( 5 - \sqrt{1 - 4x} = -x \)

5. Solve:
   (a) \( x^2 < 9 \)
   (b) \( -3 - |2x + 5| \leq -11 \)
   (c) \( \frac{2x - 5}{x + 1} \leq 1 \)
6. The diagonal of a rectangle is 6 inches longer than the width. The length is 12 inches. Find the width of the rectangle and find the area of the rectangle.

7. Find an equation for the line:
   (a) that has slope 3 and passes through the point (4, 1).
   (b) that passes through the points (2, 0) and \((-\frac{1}{3}, 5)\).
   (c) that is perpendicular to the line \(y = 5\) and passes through the point \((-3, 2)\).
   (d) that is parallel to the line \(-2y + 7x = 3\) and passes through the point \((1, -3)\).

8. The graph of a function \(f\) is given (on the board).
   (a) What is the value of \(f(-1)\)?
   (b) For what values of \(x\) is \(f(x) = 2\)?
   (c) What are the domain and range of \(f\)?

9. Find the domain of the function:
   (a) \(f(x) = \frac{3x - 1}{2x^2 + x - 6}\)
   (b) \(g(x) = \sqrt{6 - x} + \sqrt{x^2 - 1}\)
   (c) \(h(x) = \frac{5x}{\sqrt{x^2 + 1}}\)
   (d) \(k(x) = \cos(\sqrt{3 - x})\)

10. Given that \(f(x) = 2x^2 - 1\), \(g(x) = 2x + 3\), and \(h(x) = \frac{1}{x - 1}\), find and simplify
    (a) \(4h(3) + 2[g(2)]^2\)
    (b) \((g \circ f)(x)\)
    (c) \((g \circ f)(-2)\, \frac{(f \circ f)(-1)}{h}\)
    (d) \(\frac{f(3 + h) - f(3)}{h}\)
    (e) \(\frac{h(x + a) - h(x)}{a}\)

11. Five the formula of a rational function \(f\) such that the graph of \(f\) has asymptotes of \(x = -1\), \(x = 2\), and \(y = 3\), and satisfies \(f(1) = -2\) and \(f(3) = 6\). Graph your function, labeling intercepts and asymptotes.

12. A thin piece of copper wire 20 inches in length is to be cut into two parts. From one part, a square will be made; from the other, a circle. Let \(x\) = the length of the side of the square.

   (a) Suppose \(A\) is the function \(A(x) = \text{sum of the areas of the two figures}.\) Determine the formula for \(A\) in terms of \(x\).
   (b) Determine the domain of this function.
13. Graph the following

(a) \( y = 5 - x^2 \)
(b) \( y = 3\sqrt{x} \)
(c) \( y = (x + 2)^3 - 1 \)
(d) \( y = \frac{1}{x - 1} \)