I. Simplify the following:

1. \((2x + 3)(x - 1) + (x - 4)^2\)

2. \(\frac{\left(x^2y^{-3}\right)^2}{\left(2x^3\right)^4}\)

3. \(\frac{1}{x + 2} - \frac{3}{x}\)

4. \(\frac{5}{4 - \sqrt{3x}}\) (rationalize the denominator)

5. \(x^2(x - 6)^{-1/2} + (x - 6)^{1/2}\) (factor completely)

II. Given the points \((-3, 4)\) and \((2, 1)\), find:

6. The slope and the equation of the line through the points.

7. Find the x and y-intercepts of the line.

III. Given \(f(x) = \sqrt{x - 5}\) and \(g(x) = \frac{x}{x^2 - 9}\)

8. Find the domain of each function.

9. Find \(g(f(9))\)

10. For what values of \(x\) is each function discontinuous?

IV. Sketch a graph where: \(f(2) = 3\) and \(\lim_{x \to 2} f(x) = 1\)

V. Find \(\lim_{x \to 2} \frac{2x - 4}{x^2 + x - 6}\)

12. Graphically

13. Algebraically

VI. Find the indicated limits, state if they do not exist.

14. \(\lim_{x \to 2} \frac{x}{x^2 - 5x}\)

15. \(\lim_{x \to 0} \frac{x}{x^2 - 5x}\)

16. \(\lim_{x \to 5} \frac{x}{x^2 - 5x}\)

17. \(f(x) = \begin{cases} 2x + 3 & \text{if } x < 1 \\ x^2 & \text{if } x \geq 1 \end{cases}\) find: \(\lim_{x \to 3} f(x)\) and \(\lim_{x \to 1} f(x)\)

VII. Explain what it means for \(f(3) = 4\) and \(f'(3) = 2\).

VIII. Use the definition to find the derivative of \(f(x) = x^2 + 3x\).

IX. A company has fixed cost of $30,000, a cost of $6 for each unit it manufactures, and a unit sells for $13. What is its profit function for \(x\) items and what is its profit for producing 12,000 items?