This exam will cover sections P.1 through 4.4 omitting section 1.5. You should know general terms and definitions from each of these sections, review previous exams, quizzes, homework assignments, and review sheets. Pay particular attention to the subjects outlined below.

1. **Chapter P**
   (a) Properties of the four basic arithmetic operations, number sets, and order of operation.
   (b) Performing basic operations on polynomials and rational expressions.
   (c) Working with positive, negative, and rational exponents and with radicals.
   (d) Working with imaginary and complex numbers.
   (e) Converting between standard and scientific notation.

2. **Chapter 1**
   (a) Solving linear equations and story problems (including absolute value equations).
   (b) Plotting points, finding mid-points, finding distance, and graphing equations.
   (c) Graphing circles and finding the equation of a circle.
   (d) Graphing lines and finding the equation of a line in: general form, slope-intercept form, and point-slope form.
   (e) Relationship between perpendicular and parallel lines.
   (f) Solving quadratic equations by factoring, completing the square, or using the quadratic formula.
   (g) Solving linear and absolute value inequalities and expressing solutions as graphs or intervals.

3. **Chapter 2**
   (a) Evaluating functions and finding their domain and range.
   (b) Graphing functions, relations, and piece-wise defined functions.
   (c) Graphing functions using transformations.
   (d) Adding, subtracting, multiplying, dividing, and composing functions.
   (e) Identifying one-to-one functions and finding their inverses.
   (f) Working with functions involving variation.

4. **Chapter 3**
   (a) Graphing quadratic functions using the \( a(x - h)^2 + k \) form.
   (b) Finding the zeros of polynomial functions using: reminder theorem, rational roots theorem, synthetic division, conjugate pairs theorem, Descartes's rule of signs, and upper/lower bounds.
   (c) Solving equations involving polynomials.
   (d) Graphing polynomial functions using tools such as: behavior at \( x \)-intercepts, long-term behavior, degree, symmetry, and specific points.
   (e) Graphing rational functions using tools such as: horizontal and vertical asymptotes, \( x \)- and \( y \)-intercepts, and specific points.
   (f) Solving polynomial or rational inequalities using a sign graph.
5. Chapter 4
(a) Evaluating exponential functions and finding their domain and range.
(b) Graphing rational functions using transformations.
(c) Evaluating simple logarithmic functions without a calculator.
(d) Graphing logarithms using transformations.
(e) Simplifying logarithms using the product rule, the quotient rule, and the power rule.
(f) Solving logarithmic and exponential equations.

Below is a list of sample problems representing the types you will see from sections 4.2-4.4. See previous review sheets, exams, and your book’s review sections for problems from previous chapters.

1. Evaluate without using a calculator.
   (a) $\log_2 16$
   (b) $\log(0.01)$
   (c) $\log_{27} 3$
   (d) $\log_3 18 - \log_3 2$
   (e) $\log_9 27$

2. Simplify each expression using rules of logarithms.
   (a) $\ln(x^2 - y^2)^3$
   (b) $\log_3 \left( \frac{x^3}{y^2} \right)$

3. Solve each equation involving logarithms and exponents.
   (a) $3e^{x-1} = 12$
   (b) $2e^{x-1} = 8$
   (c) $\log(3x + 1)^2 = 6$
   (d) $\log_3(1 + 5x) = 2$
   (e) $\log_2(x - 2) + \log_2(x + 2) = 3$

4. Match the following functions with their graphs.
   m. $\ln -x$
   n. $e^x$
   o. $-\ln x$
   p. $e^{-x}$
   q. $\ln x$
   r. $-e^x$

   ![Graphs](1), (2), (3), (4)