# PRECALCULUS

**GOALS:** Students will develop skills and understanding in:

1. Solving problems with linear equations and inequalities
2. Solving problems involving the concept of functions and the notation of functions
3. Solving problems using equations involving polynomial functions
4. Solving problems using rational functions
5. Solving problems using radical functions
6. Solving problems involving exponential and logarithmic functions
7. The use of circular functions
8. Solving problems involving trigonometric functions of a right triangle
9. Solving problems involving trigonometric functions and identities
10. Solving problems involving operations on complex numbers
11. Graphing polynomial and rational functions
12. Recognizing and graphing the equations of conic sections

**OBJECTIVES**: Students will be able to:
*(Parentheticals refer to Precalculus – Functions and Graphs, Swokowshi and Cole 9th Edition, 2002)*

**Goal 1. Solving problems with linear equations and inequalities**

1.1. Find a linear equation given the slope and one point (1.8)
1.2. Find a linear equation given two points (1.8)
1.3. Determine by inspection if two lines are parallel, perpendicular, or neither (1.8)
1.4. Write the equation of a line parallel to a given line through a given point (1.8)
1.5. Write the equation of a line perpendicular to a line through a given point (1.8)
1.6. Use the distance formula to determine the distance between two points (1.7)
1.7. Use the midpoint formula to determine the midpoint of a line segment (1.7)
1.8. Solve linear equations (1.4)
1.9. Solve linear inequalities (1.6)
1.10. Graphing linear equations (1.8)
1.11. Graph linear inequalities involving a single variable (1.6)
1.12. Solve absolute value equations and inequalities involving a single variable (1.4, 1.6)
1.13. Graph absolute value involving a single variable (1.6)
1.14. Solve applied problems employing linear equations (1.8)

**Goal 2. Solving problems involving the concept of functions and the notation of functions**

2.1. Determine the domain and range of a function (2.1)
2.2. Determine whether a relation is a function (2.1)
2.3. Evaluate functions (2.1)
2.4. Find composition of functions and their domain (2.4)
2.5. Determine if a function possesses symmetry (1.7)
2.6. Sketch transformations of a graph (2.2)
2.7. Determine if a function is odd, even, or neither (2.2)
2.8. Determine if a function is increasing, decreasing or constant (2.1)
2.9. Write interval notation for a given set (1.6)
2.10. Sketch piece-wise functions and greatest integer functions (2.2)
2.11. Determine whether a function has an inverse (2.5)
2.12. Find the inverse of a function algebraically (2.5)
2.13. Find the inverse of a function graphically (2.5)
2.14. Determine if two functions are inverses (2.5)
2.15. Solve applied problems using quadratic functions (2.3)

**Goal 3. Solving problems using equations involving polynomial functions**

3.1. Solve quadratic equation by factoring (1.4)
3.2. Solve quadratic equations with the quadratic formula (1.4)
3.3. Write polynomial equations given the solutions to the equation (2.3, 3.2, 3.4)
3.4. Write polynomial equations given their graphs (2.3, 3.3, 3.4)
3.5. Write quadratic equations in standard form by completing the square (2.3)
3.6. Graph quadratic equations in standard form (2.3)
3.7. Determine the vertex, line of symmetry and maximum or minimum values of a quadratic in standard form (2.3)
3.8. Determine the intercepts of a quadratic function (2.3)
3.9. Determine the nature of the solutions for quadratic and higher degree polynomial equations (1.5, 2.3, 3.3)
3.10. Solve quadratic and higher degree polynomial inequalities involving a single variable (1.6)
3.11. Perform algebraic operations on polynomial functions (2.4)
3.12. Solve applied problems using higher degree polynomial functions (3.1, 3.4)

**Goal 4. Solving problems using rational functions**

4.1. Solve rational inequalities (1.6)
4.2. Multiply two fractional expressions (1.3)
4.3. Divide two fractional expressions (1.3)
4.4. Simplify fractional expressions (1.3)

4.5. Divide a polynomial by a polynomial (3.2)
4.6. Solve fractional equations (1.4)

**Goal 5. Solving problems using radical functions**

5.1. Find principle square and cube roots (1.2)
5.2. Simplify radical expressions (1.2)
5.3. Multiply and simplify radical expressions (1.2, 1.3)
5.4. Simplify radical expressions with a quotient as a radicand (1.2, 1.3)
5.5. Divide and simplify radical expressions (1.2, 1.3)
5.6. Rationalize denominators of radical expressions (1.2, 1.3)
5.7. Write expressions with fractional exponents as radical expressions and vice versa (1.3)
5.8. Convert between negative and positive exponents (1.2, 1.3))
5.9. Use fractional exponents to simplify radicals (1.2)
5.10. Solve radical equations with one or two radicals (1.4)
5.11. Express square root of a negative number as an imaginary number (1.5)
5.12. Graph radical functions (1.7)

**Goal 6. Solving problems involving exponential and logarithmic functions**

6.1. Simplify exponential expressions (1.2)
6.2. Graph exponential functions (4.1, 4.2)
6.3. Graph logarithmic functions (4.3, 4.4)
6.4. Convert exponential equations to logarithmic (4.3, 4.4)
6.5. Convert logarithmic equations to exponential (4.3, 4.4)
6.6. Solve exponential equations (4.1, 4.5)
6.7. Solve logarithmic equations (4.3, 4.4, 4.5)
6.8. Use basic properties of logarithms (4.3, 4.5)
6.9. Solve applied problems involving exponential or logarithmic equations (4.4, 4.5)
6.10. Change log bases to solve logarithmic and exponential equations (4.5)

**Goal 7. The use of circular functions**

7.1. Apply the definition of trigonometric functions to map real numbers onto the unit circle (5.3)
7.2. Evaluate the trigonometric functions for standard angles on the unit circle (5.3)
7.3. Graph the six trigonometric functions as well as transformations of these functions (5.3, 5.5, 5.6)
7.4. Convert angles from radians to degrees and degrees to radians (5.1)
7.5. Solve application problems using circular functions (5.1, 5.5, 5.7)
7.6. Graph the inverse trigonometric functions and their transformations (6.6)

**Goal 8. Solving problems involving trigonometric functions of triangles**

8.1. Evaluate the six trigonometric functions for a right triangle (5.2)
8.2. Solve right triangle problems (5.2)
8.3. Solve application problems using right triangles (5.7)
8.4. Apply the law of sines to triangles (7.1)
8.5. Apply the law of cosines to triangles (6.2)

**Goal 9. Solving problems involving trigonometric functions and identities**

9.1. Apply the fundamental identities (5.2, 6.1)
9.2. Apply the sum and difference identities (6.3)
9.3. Apply the double angle identities (6.4)
9.4. Apply the half-angle identities (6.4)
9.5. Apply trigonometric identities to solve trigonometric equations (5.3, 6.2, 6.3, 6.4, 6.5)
9.6. Apply inverse trigonometric functions to find solutions to trigonometric equations (6.6)

**Goal 10. Solving problems involving operations on complex numbers**

10.1. Express the square root of -1 as "i" (1.5)
10.2. Add complex numbers (1.5)
10.3. Subtract complex numbers (1.5)
10.4. Multiply complex numbers (1.5)
10.5. Divide complex numbers (1.5)
10.6. Solve quadratic with complex solutions (1.5)
10.7. Find the equation given the complex solutions (3.4)

**Goal 11. Graphing polynomial and rational functions**

11.1. Determine the degree of the terms and the degree of a polynomial (1.3)
11.2. Determine whether a number is a root of a polynomial (3.2)
11.3. Find the quotient and remainder given the polynomial and the divisor (3.2)
11.4. Use synthetic division to determine quotients, remainders, and test for zeros (3.2)
11.5. Use the remainder theorem to find P(r) (3.2)
11.6. Factor a polynomial and find its roots and their muliplicity (3.1, 3.2, 3.3, 3.4)
11.7. Find a polynomial with specified roots (3.2, 3.3, 3.4)
11.8. Determine the upper and lower bounds for zeros of polynomial functions (3.3)
11.9. Find the possible rational roots of a polynomial with integer coefficients (3.4)

11.10. Graph quadratic and higher degree polynomial functions (2.3, 3.1)
11.11. Determine the asymptotes and removable discontinuities of a rational function (3.5)
11.12. Graph rational functions (3.5)

**Goal 12. Recognizing and graphing the equations of conic sections**

12.1. Write the equation of a circle given the center and radius (1.7)
12.2. Graph a circle (1.7)
12.3. Write equations for upper, lower, right, and left half of a circle (1.7)
12.4. Find the Center and Radius of a circle by completing the square