Math Department

Year of 2025-2026

Lessons required for the Math Entrance Exam:(Grade 11ADP to 12ADP)

(Precalculus)

*Calculator is needed

1. **Polynomials and Factoring**

   Students should be able to:

   - Add and subtract polynomials.
   - Multiply polynomials.
   - Multiply radical expressions involving multiple terms.
   - Factor polynomials.
   - Factor expressions containing negative and rational exponents.

2. **Equations with real solutions**

   Students should be able to:

   - Solve quadratic equations with real solutions.
   - Solve rational equations.
   - Solve absolute value equations.
   - Solve radical equations.
   - Solve equations for a specified variable.

3. **Complex Numbers and Quadratic Equations**

   Students should be able to:

   - Simplify imaginary numbers.
   - Perform operations on complex numbers.
   - Solve quadratic equations over the set of complex numbers.

4. **Linear, Compound and Absolute Value Inequalities**

   Students should be able to:

   - Solve linear inequalities in one variable.
   - Solve compound linear inequalities.
   - Solve absolute value inequalities.
   - Write the solution using inequality symbols and interval notation.

5. **Circles**

   Students should be able to:

   - Write an equation of a circle in standard form.
   - Write the general form of an equation of a circle.

6. **Functions and Relations**

   Students should be able to:

   - Determine whether a relation is a function.
   - Determine x- and y-intercepts of a function defined by $y = f(x)$.
   - Determine domain and range of functions.
   - Interpret a function graphically.

7. **Linear Equations in Two Variables and Linear Functions**

   Students should be able to:

   - Graph linear equations in two variables.
   - Determine the slope of a line.
   - Write the slope-intercept form/point-slope form of a line.
   - Solve equations and inequalities graphically.
   - Determine the slopes of parallel and perpendicular lines.

8. **Applications of Linear Equations and Modeling**

   Students should be able to:

   - Create linear functions to module data.
   - Create Modules using linear regression.

9. Transformations of Graphs

Students should be able to:

- Recognize the graphs of basic functions.
- Apply vertical and horizontal translations (Shifts).
- Apply vertical and horizontal shrinking and stretching.
- Apply reflections across the x- and y-axis.

10. Analyzing Graphs of Functions and Piecewise-Defined Functions

Students should be able to:

- Test for symmetry.
- Identify even and odd functions.
- Graph piecewise-defined functions.
- Investigate increasing, decreasing, and constant behavior of a function.
- Determine relative minima and maxima of a function.

11. Algebra of Function and Function Composition

Students should be able to:

- Perform operations on functions.
- Compose and decompose functions.

12. Quadratic Functions and Applications

Students should be able to:

- Graph a quadratic function.
- Write a quadratic function in vertex form.
- Find the vertex of a parabola by using the vertex formula.
- Solve applications involving quadratic functions.
- Create quadratic modules using regression.

13. Introduction to Polynomial Functions

Students should be able to:

- Determine the end behavior of a polynomial function.
- Identify zeros and multiplicity of zeros of a polynomial function.
- Apply the intermediate value theorem.
- Sketch the graph of a polynomial function.
- Solve polynomial inequalities (with applications).

14. Division of Polynomials and the Remainder and Factor Theorems

Students should be able to:

- Divide Polynomials using long division.
- Divide Polynomials using synthetic division.
- Apply remainder and factor theorems.

15. Rational Functions

Students should be able to:

- Determine the domain of definition of rational functions.
- Describe the infinite-behavior and end-behavior of a rational function.
- Identify vertical, horizontal and slant asymptotes.
- Graph rational functions.
- Use rational functions in applications.
- Solve rational inequalities (with applications).

16. Inverse Functions

Students should be able to:

- Identify one-to-one functions.
- Determine whether two functions are inverses.
- Find the inverse of a function.

17. Exponential Functions

Students should be able to:

- Graph exponential functions.
- Use exponential functions to compute compound interest and in other applications.

18. Logarithmic Functions

Students should be able to:

- Convert between logarithmic and exponential forms.
- Evaluate logarithmic expressions.
- Apply basic properties of logarithms.
- Graph logarithmic functions.
- Use logarithmic functions in applications.

19. Properties of Logarithms

Students should be able to:

- Apply the product, quotient and power properties of logarithms.
- Write a logarithmic expression in expanded form.
- Write a logarithmic expression as a single logarithm.
- Apply the change-of-base formula.

20. Exponential and Logarithmic Equations and Applications

Students should be able to:

- Solve exponential equations.
- Solve logarithmic equations.
- Use exponential and logarithmic equations in applications.