Syllabus for Mathematics 1 recruitment test
IITM Online Degree Project

1. Basics of discrete mathematics: Sets. Natural numbers, integers. Divisibility, prime numbers. Rational and real numbers. Relations. Functions.

2. Straight lines: Axis. Points. Slope. Equation of line - different forms. Distances. Distance of a set of points from a line (multiple distances). Problem of straight-line fit (only the problem). Orthogonality. Projection. Sine and Cosine of angles. Parameterizing straight lines $y = ax + b$.

3. Quadratic equations: Parabola. Contrast with straight lines. Slopes of curves, tangent lines. Minimization, maximization. Parameterizing quadratic curves.

4. Polynomials: The algebra of polynomials - addition, subtraction, multiplication, division. Roots of polynomials - linear, quadratic, cubic and higher. Drawing graphs and visualising polynomials. Solving equations and finding intersections. Curves through a given set of points.

5. Exponentials and logarithms: Powers of a number. Exponentials with base 2, 10 etc. Comparing 2^x with x^n and polynomials using graphs. Definition of logarithms to the base 2, 10 etc. Comparing $\log_2(x)$ with x^ϵ, x, x^2 and polynomials using graphs. Exponential function e^x and natural logarithm $\ln(x)$.

6. Relations and Graphs: Representing relations as graphs. Transitive closure and matrix multiplication. Warshall's Algorithm.

7. Other Graph problems: Real world examples. Connectivity. Spanning Trees. Shortest path problem. Colouring. Matching.