SYLLABUS FOR THE ENTRANCE TEST IN MATHEMATICS, JOINT DEGREES, AND COMPUTER SCIENCE

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- **Polynomials:** The quadratic formula. Completing the square. Discriminant. Factorisation. Factor Theorem. Remainder Theorem.

- **Algebra:** Simple simultaneous equations in one or two variables. Solution of simple inequalities. Binomial Theorem with positive whole exponent.

- **Differentiation:** Derivative of x^a, including for fractional exponents. Derivative of a sum of functions. Tangents and normals to graphs. Turning points. Second order derivatives. Maxima and minima. Increasing and decreasing functions.

- **Integration:** Indefinite integration as the reverse of differentiation. Definite integrals and the signed areas they represent. Integration of x^a (where $a \neq -1$) and sums thereof. The trapezium rule and its use in estimating areas.

- **Graphs:** The graphs of quadratics and cubics. Graphs of
$$\sin x, \quad \cos x, \quad \tan x, \quad \sqrt{x}, \quad a^x.$$
Solving equations and inequalities with graphs.

- **Logarithms and powers:** Laws of logarithms and exponentials. Solution of the equation $a^x = b$.

- **Transformations:** The relations between the graphs
$$y = f(ax), \quad y = af(x), \quad y = f(x-a), \quad y = f(x) + a$$
and the graph of $y = f(x)$.

- **Geometry:** Co-ordinate geometry and vectors in the plane. The equations of straight lines and circles. Basic properties of circles. Lengths of arcs of circles. Sine and cosine rules for triangles.

- **Trigonometry:** Radians. Solution of simple trigonometric equations. The identities
$$\tan x = \frac{\sin x}{\cos x}, \quad \sin^2 x + \cos^2 x = 1, \quad \sin\left(\frac{\pi}{2} - x\right) = \cos x.$$
Periodicity of sine, cosine and tangent.

- **Sequences and series:** Sequences defined iteratively and by formulae. Arithmetic and geometric progressions. Their sums. Convergence condition for infinite geometric progressions.