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| * Prerequisites   + Common Functions   + The Number Systems     - Naturals     - Integers     - Rationals * Real Numbers, Infinite Sequences, Functions   + The axioms of the real numbers, including     - the field axioms,     - the order axioms, and     - the completeness axiom. * Limits of Functions   + Definition of the limit of a function   + Examples of some limits of functions using     - Algebra     - Graphs     - tables   + One-sided Limits   + Limits at infinity   + Applications:     - Asymptotic behavior of functions     - relative rates of change     - relative magnitudes   + Continuity of a function     - limit definition and     - some examples of families of continuous functions   + Intermediate Value Theorem   + Extreme Value Theorem * Derivatives   + Definition of the derivative     - difference quotient     - Properties of the derivative operation: product rule, quotient rule, chain rule   + Interpretation of the derivative     - graphical,     - numerical, and     - analytic and as     - the instantaneous rate of change   + Differentiability and continuity   + Derivatives at points:     - slope of curve at a point     - non-existence     - vertical tangents     - Linear approximation of curve by derivative at a point     - approximations of derivative at a point   + Derivative as a function     - the corresponding characteristics between f and its derivative, namely increasing, decreasing behavior;     - mean-value theorem for derivatives and geometric interpretation;     - examples of equations in which derivatives show up (some famous differential equations);     - Derivatives of common functions   + Second Derivatives     - Corresponding characteristics between f, f’, and f’’     - concavity and points of inflection   + Applications     - Analysis of curves – monotonicity, concavity     - Analysis of planar curves given in parametric, polar, and vector form, notably velocity and acceleration     - Optimization: critical points, extreme value theorem revisited, rolle’s theorem, relative (local) and absolute (global) extrema     - Modeling rates of change and related rates problems     - Implicit differentiation and derivative of inverse function     - Differential equations: slope fields, relationships between solution curves and the slope fields, Euler’s method     - L’Hospital’s Rule, application to limits * Integration   + Definition and Properties     - Definition by Riemann sums     - Definition by Darboux sums   + Properties of the integral, including additivity, linearity, by-parts, u-substitution, etc   + Numerical Approximation to Definite integrals     - Use of Riemann Sums     - Left, right, midpoint, trapezoidal approximations   + Fundamental Theorems of Calculus     - Use to evaluate definite integrals     - Antidifferentiation   + Techniques of Antidifferentiation and Integration     - Directly from derivatives of basic functions     - U-substitution     - By-parts (including repeated by-parts)     - Partial fractions     - Trigonometric substitution   + Improper Integrals     - Gabriel’s Horn   + Arc Length   + Volumes of Rotation and by Cross-Section   + Area Between Curves   + More Differential Equations     - Separable Differential Equations     - Logistic Differentiation Equations     - First-order Linear differential equations * Polar and Parametric Equations   + Definition of Parametric Equations   + Differentiation of Parametric Equations   + Integration of Parametric Equations   + Converting from Parametric to Rectangular   + Definition of Polar Equations   + Differentiation of Polar Equations   + Integration of Polar Functions   + Converting from Polar to Rectangular   + Arc Length in Polar and parametric * Polynomial Approximations and Infinite Series   + Reminder of infinite sequences     - Main theorems (Cauchy, Monotone Convergence, etc)   + Some important results with finite sums     - Geometric sum     - Summation By-parts   + Definition of Infinite series and Tests of Convergence/ Divergence     - Motivations (infinite decimals)     - Definition as limit of partial sums     - Cauchy Criterion     - N-th term test     - Geometric Series Test, nudge to Power Series     - Cauchy Condensation Test     - P-series test and the harmonic series     - Direct and limit comparison tests     - Ratio and root tests, nudge to Taylor Series     - Alternating series tests     - Integral Test   + Taylor Series     - Taylor Polynomial Approximations and Taylor’s Theorem (Lagrange Error bound)     - Definition of Maclaurin and Taylor series for general functions     - Maclaurin and Taylor series for common functions     - Manipulation of Taylor Series; integration, differentiation, substitution, etc     - Functions and Power series representations     - Radius and Interval of Convergence of Power series, Taylor Series (attention paid to end-points) | 1M  1M  1A  2M  2M  2A  2M  2A  2A  2A  3M  3M/3A  3A  4M  4M/4A  5M  5A  6M  7M  7A  8M  8A  9M  9A  10M  10A  11M  11A  12M  12A  13M  13A  15M  15A  16M  16A  17M  17A  18M  18A  21M  21A  21A  22M  22M  22M |