

INDEX

- Absolute convergency, 149
Absolute value, 17
Actual error, 223
Aggregate, 15
Alternating series, 145
Angle between radius vector and
 tangent, 443
Angle between two curves
 Cartesian, 439
 Polar, 454
Approximate
 Calculation, 222
 value, 223
Archimedes' Spiral, 576
Argument, 18
Arithmetical continuum, 6
Associate Loci, 546
Astroid, 570
Asymptote, 505
 not parallel to y-axis, 505
 of alg. curves, 506, 507
 of polar curves, 513
 parallel to y-axis, 506, 510, 518
 special case, 508, 512,
Average curvature, 470
Bernoulli's Inequality, 470
Bounded function, 24
Bounded sequence, 113
Bounds, 24
Cardioid, 576
Catenary, 577
Cauchy's condition for the Existence
 of limit, 67
Cauchy's General principle of
 Convergence, 122
 mean value theorem, 284
 root test, 147
Cauchy's form of remainder, 280
 in binomial expansion, 281
 in logarithmic expansion, 251
 in Maclaurin's expansion, 280
 in Taylor's expansion,
Centre of curvature, 471, 494, 496
Chainette, 568
Characteristic points, 538
Chord of curvature, 471
 through the origin (pole), 480
Circle of curvature, 471, 492
Cissoid of Diocles, 574
Comparison test, 145
Closed interval, 16
Complex numbers, 144
Concavity and convexity, 558
 analytical test, 559
 criterion, 561
Constant, 16
Continuity, 86, 375
Continuity of
 elementary function, 94
 exponential function, 95
 inverse circular function, 95
 logarithmic function, 96
 polynomial, 95
 rational alg. function, 95
 trigonometric function, 95
Continuity on one side, 39
Continuous function properties, 90
Continuous variable, 16
Continuum
 arithmetic, 6
 linear, 6
Convergence
 of geometric series, 141
Convergent sequence, 115
 theorems, 117
Converse of Euler's theorem, 391
Critical value, 320
Cusp
 different types of, 580
 double, 581
 of the first species, 581
 of the second species, 581
 single, 580
 species of a, 581
Curvature, 470
 a theorem, 476
 at the origin, 477
Cycloid, 566
D'Alembert's ratio test, 146
Darboux's theorem, 282
Dedekind's theorem, 6
De Moivre's theorem, 247
Dependent variable, 17
Derivative, 171
 infinite, 172
 left-hand, 172
 partial, 376
 right-hand, 172
 sign, 218, 219

- Derivatives of arc length
 Cartesian, 441
 polar, 453
- Derivatives of the coeff. of...
 and $f(x+h)$, 296
- Different classes of
 discontinuity, 88
 infinite, 89
- Different classes of discontinuity
 ordinary, 88
 oscillatory, 89
 removable, 89
 simple, 89
- Different def. of asymptote, 505, 515
- Differential, 221, 388
 exact, 389
- Differential coefficient, 221
 in some standard cases, 173
- Differentiate,
- Differentiation, 170
 from first principal, 181
 fundamental theorems on, 178
 of a function of a function, 191
 of implicit function, 395
- Discontinuity, 88
- Divergent sequence, 116
- Division by zero, 18
- Domain, 20
- Double Cusp, 581
- Envelope, 528
 of curves, 536
 of normals, 530
 of straight lines, 529
 of tangents, 530
 of two-parameter family, 538
 of system of parabolas, 539
- Equality of $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$, 377
- Equation of
 Normal, 437
 tangent, 433
- Equiangular spiral, 575
- Euler's theorem
 converse of, 391
 on homogeneous fn., 391
- Evaluation of certain limits, 349
 indeterminate forms, 349
 using power series, 353
- Evolutes, 496, 530
 of ellipse, 571
 of parabola, 571
 properties, 496
- Exact differential, 389
- Expansion in powers of x
 binomial function, 296
 cosine function, 294
 exponential function, 294
 logarithmic function, 294
 sine function, 293
- Expansion of function, 273
 in Infinite power series, 292
- Exponential curve, 573
- Extremal, 320
- Extremum, 320
- Fermat's theorem, 329
- First principle, 181
- Folium of Descartes, 572
- Four-cusped hypocycloid, 570
- Functions, 15, 17, 20
 bounded, 24
 graphical representation, 19
 hyperbolic,
 monotone, 26
 multiple-valued, 18, 375
- Functions,
 of a function, 191
 single-valued, 18, 375
 several variables, 375
- Fundamental theorems
 on differentiation, 178
 on limit, 56
- Gauss's Test, 148
- Generalised mean value theorem, 276
- Geometrical Interpretation
 of the derivatives, 220, 435
 of Rolle's theorem, 274
- Geometrical representation
 of $z = f(x, y)$, 375
- Gradient, 221
- Graphical representation of fn., 19
- Homogeneous function, 385
- Hyperbolic function, 194
- Important
 Inequality, 121
 limits, 62
 limits on sequence, 117
- Increment, 170
- Independent variable, 17
- Indeterminate forms, 349
- Infinite
 derivative, 172
 discontinuity, 90
 limit, 55
 sequence, 111

- Integer, 1
 Interval of convergence, 150, 298
 determination, 150
 Interval of function, 16
 closed, 16
 length, 16
 open, 16
 Inverse
 of a parabola, 559
 of a straight line, 554
 of the pedal, 553
 Inverse circular function, 192
 Inverse curve, 549
 from Cartesian eqn., 550
 from pedal eqn., 551
 from polar eqn., 551
 Involute, 496
 Irrational numbers, 2
 Keratoid Cusp, 581
 Lagrange's form of remainder, 277
 Lagrange' method of undetermined
 multipliers, 425
 Law of refraction, 329
 Left-hand
 derivative, 172
 limit, 53
 Leibnitz's theorem, 256
 Lemniscate, 577
 of Bernoulli, 578
 Length of an arc
 of an evolute, 497
 L' Hospital's theorem, 283
 Limacon, 349
 Limit, 47
 of a function, 48
 of product of two functions, 57
 of quotient of two fns., 62
 of sum of or difference of two
 functions, 58
 Limit of a function of a function, 60
 Limit of $\frac{\text{chord } PQ}{\text{arc } PQ}$ as $Q \rightarrow P$, 440
 Linear continuum, 6
 Logarithmic curve, 573
 Logarithmic spiral, 575
 Lower bound of a sequence, 118
 Maclaurin's Series
 finite forms, 297
 Infinite forms, 293, 297
 Maxima and minima, 315, 317
 determination, 317, 420
 necessary and-sufficient
 condition, 316, 420
 of function of two variables, 420
 working rule, 319
 Mean value theorem, 275
 geometrical Interpretation, 276
 Meaning of $\frac{dp}{d\psi}$, 379
 Methods of expansion, 298
 Monge's notation, 379
 Monotone function, 26
 Monotonic sequence, 114
 Monotonically
 decreasing and Increasing, 26
 Multiple-valued function, 18, 375
 Necessary and sufficient
 condition for the
 convergence of a sequence, 122
 existence of a limit, 67
 Newton's formula for curvature, 477
 n th derivatives of
 some special function, 247
 Null sequence, 121
 Numbers, 1
 On some well-known curves, 566
 Open Interval, 16
 Ordinary discontinuity, 88
 Oscillatory discontinuity, 89
 Osculinflexion, 581
 Parameter, 528
 Partial
 derivatives, 376, 390
 differentiation, 375
 Pedal curves, 546
 from Cartesian equation, 546
 from pedal equation, 549
 from polar equation, 547
 properties, 547
 Pedal equation, 456
 from Cartesian, 456
 from polar, 456
 of ellipse, 459
 of parabola, 458
 of sine spiral, 451
 Percentage error, 223
 Perfect differential, 389
 of two function, 390
 generalisation, 391
 Perpendicular from pole on tangent, 455
 Point of Inflesion, 559
 analytical condition, 561
 general criterion, 562
 Point of Osculinflexion, 581

- Polar reciprocal, 552
 - of parabola, 555
 - of polar reciprocal, 552
 - of $p = f(r)$, 555
- Positive Integers, 1
- Power series, 151
 - properties,
- Pringsheim's theorem, 144
- Probability curve, 573
- Properties of cont. function, 90
- Raabe's Test, 148
- Radius of convergence, 151
- Radius of curvature, 472
 - from Cartesian equation, 472
 - from Implicit equation, 473
 - from parametric equations, 473
 - from pedal equation, 475
 - from polar equation, 474
 - from tangential polar eqn., 475
- Radius of curvature
 - of evolute, 498
- Ramphoid Cusp,
 - fraction, 249
- Rate-measurer, 218
- Rate of change, 15
- Rational
 - number, 1
 - point, 1
 - section, 4, 5
- Real number, 5
 - properties, 6
- Relative error, 223
- Remainder
 - Cauchy's form, 279
 - Lagrange's form, 278
- Remarks on functions, 20
- Removable discontinuity, 89
- Right-hand
 - derivative, 172
 - limit
- Rolle's theorem, 273
- Rose petals, 578
- Section, 3, 4
 - of rational number, 3, 4
- Semi-cubical parabola, 571
- Sequence, 111
 - convergent, 115
 - divergent, 116
 - null, 121
 - oscillatory, 116
- Set, 15
- Sing of the derivatives, 218, 219
- Significance of derivatives, 218
- Sine Spiral, 579
- Single Cusp, 580
- Single-valued fn., 18, 375
- Slope, 221
- Small error in calculation, 225
- Some well-known curves, 566
- Species of a Cusp, 581
- Strophoid, 574
- Subtangent, Subnormal
 - Cartesian, 439
 - polar, 454
- Successive differentiation, 246
- Successive partial derivatives, 377
- Sum of an infinite series, 139
- Symbol of Infinity, 55
- Symbolic operation, 257
 - important results, 257
- Tangent and normal, 433
- Tangent at the origin, 435
- Taylor's series
 - finite form, 276
 - infinite form, 292
- Term by Term
 - differentiation, 152
 - integration,
- Test for absolute convergence, 148
- Test of convergence, 145
- Theorems on
 - sequence, 117
 - curvature, 477
- Total differential coefficient, 387
- Tractrix, 569
- Transcendental number, 3
- Turning value, 320
- Variable
 - dependent, 17
 - independent, 17
- Witch of Agnesi, 575
- Working rule for finding
 - asymptote of alg. curve, 510
 - max. & min., 317