Neutron (rest mass) $(m_n)$  
$1.675 \times 10^{-27}$ kg  
(939.6 MeV)

Planck constant $(h)$  
$6.63 \times 10^{-34}$ J·s

Proton (rest mass) $(m_p)$  
$1.673 \times 10^{-27}$ kg  
(938.3 MeV)

Speed of light $(c)$  
$3.00 \times 10^8$ m·s$^{-1}$

Contents

1 Elementary Algebra and Geometry

1. Fundamental Properties (Real Numbers) 1
2. Exponents 2
3. Fractional Exponents 2
4. Irrational Exponents 2
5. Logarithms 3
6. Factorials 3
7. Binominal Theorem 4
8. Factors and Expansion 4
9. Progression 4
10. Complex Numbers 5
11. Polar Form 6
12. Permutations 7
13. Combinations 7
14. Algebraic Equations 8
15. Geometry 9

2 Determinants, Matrices, and Linear Systems of Equations

1. Determinants 15
2. Evaluation by Cofactors 16
3. Properties of Determinants 17
3 Trigonometry

1. Triangles 24
2. Trigonometric Functions of an Angle 25
3. Trigonometric Identities 27
4. Inverse Trigonometric Functions 29

4 Analytic Geometry

1. Rectangular Coordinates 31
2. Distance between Two Points; Slope 32
3. Equations of Straight Lines 33
4. Distance from a Point to a Line 35
5. Circle 36
6. Parabola 36
7. Ellipse 39
8. Hyperbola 41
9. Change of Axes 44
10. General Equation of Degree Two 46
11. Polar Coordinates (Figure 4.16) 46
12. Curves and Equations 49
5 Series

1. Bernoulli and Euler Numbers 55
2. Series of Functions 56
3. Error Function 62

6 Differential Calculus

1. Notation 63
2. Slope of a Curve 63
3. Angle of Intersection of Two Curves 64
4. Radius of Curvature 64
5. Relative Maxima and Minima 65
6. Points of Inflection of a Curve 66
7. Taylor's Formula 67
8. Indeterminant Forms 68
9. Numerical Methods 68
10. Functions of Two Variables 70
11. Partial Derivatives 71

7 Integral Calculus

1. Indefinite Integral 73
2. Definite Integral 73
3. Properties 74
4. Common Applications of the Definite Integral 74
5. Cylindrical and Spherical Coordinates 77
6. Double Integration 78
7. Surface Area and Volume by Double Integration 79
8. Centroid 80
### 8 Vector Analysis

1. Vectors 82
2. Vector Differentiation 83
3. Divergence Theorem 85
4. Stokes' Theorem 85
5. Planar Motion in Polar Coordinates 85

### 9 Special Functions

1. Hyperbolic Functions 87
2. Gamma Function (Generalized Factorial Function) 88
3. Laplace Transforms 89
4. Z-Transform 92
5. Fourier Series 95
6. Functions with Period Other than $2\pi$ 96
7. Bessel Functions 98
8. Legendre Polynomials 100
9. Laguerre Polynomials 102
10. Hermite Polynomials 103
11. Orthogonality 104

### 10 Differential Equations

1. First Order-First Degree Equations 105
2. Second Order Linear Equations (With Constant Coefficients) 106

### 11 Statistics

1. Arithmetic Mean 109
2. Median 109
3. Mode 109
4. Geometric Mean 109
5. Harmonic Mean 110
6. Variance 110
7. Standard Deviation 110
8. Coefficient of Variation 111
9. Probability 111
10. Binomial Distribution 113
11. Mean of Binomially Distributed Variable 113
12. Normal Distribution 113
13. Poisson Distribution 115
14. Empirical Distributions 115
15. Estimation 116
16. Hypotheses Testing 116
17. t-Distribution 117
18. Hypothesis Testing with t- and Normal Distributions 118
19. Chi-Square Distribution 121
20. Least Squares Regression 123
21. The F-Distribution (Analysis of Variance) 126
22. Summary of Probability Distributions 128

Table of Derivatives 131

Table of Integrals 137

Appendix
Table A.1: Areas Under the Standard Normal Curve 212
Table A.2: Poisson Distribution 213
Table A.3: $t$-Distribution 215
Table A.4: $\chi^2$ Distribution 216
Table A.5: Variance Ratio 217

Index 219