

TABLE OF CONTENTS

PREFACE	IX
INTRODUCTION	1
CHAPTER I / THE HOPF-COLE SOLUTION OF THE NONLINEAR DIFFUSION EQUATION AND ITS GEOMETRICAL INTERPRETATION FOR THE CASE OF SMALL DIFFUSIVITY	9
1. Basic Solution	9
2. Geometric Interpretation of the Solution. – Possibility of Multiple Roots	11
3. Steep Fronts or ‘Shock Waves’. General Form of the Solution for Large Values of t	16
4. Alternative Derivation of the Approximate Solution of Equation (1.1) in the Neighborhood of a Steep Front. Additional Observations	18
CHAPTER II / DIGRESSION ON GENERALIZATIONS OF THE GEOMETRIC METHOD OF SOLUTION. – SOLUTIONS OF EQUATION (1.1) FOR THE DOMAIN $x > 0$ WITH A BOUNDARY CONDITION AT $x = 0$	21
5. Application of the Geometric Method of Solution to Slightly More General Equations	21
6. Solutions of the Nonlinear Diffusion Equation with a Boundary Condition at $x = 0$. Two Preliminary Cases	24
7. Generalization of Solution (6.6)	26
8. Extension to a Continuous Function	31
CHAPTER III / STATISTICAL PROBLEMS CONNECTED WITH THE SOLUTIONS OF CHAPTER I, FOR $v \rightarrow +0$ AND $t \rightarrow \infty$	35
9. Ensemble of Initial Data-Curves. The Parameter J	35
10. Statistics of a Chain of Parabolic Arcs	38
11. Transformation of the Statistical Problem	40
12. Additional Observations	44
CHAPTER IV / SOLUTIONS OF THE LINEAR DIFFUSION EQUATION WITH A BOUNDARY CONDITION REFERRING TO A PARABOLA	46
13. Basic Functions	46

14. Application of Green's Theorem	50
15. Solution of Equation (13.1) Assuming Prescribed Values on the Boundary	51
16. Change of the Form of the Boundary	52
17. Transformation to a Coordinate System with Inclined x -Axis	53
18. Extension of Equation (16.2)	54
19. Application of the Results of Sections 16 and 17 to a Parabolic Boundary	55
20. Integro-Differential Equation for $\theta(z)$	57
21. Series Development for $\theta(z)$	58
22. The Function $E(x)$	60
23. Application to a Parabolic Boundary	62
24. Effect of a Change of the Boundary upon $E(x)$	63
25. The Integral P_0	65
26. The Normalization Condition (10.10)	69
27. A Theorem Connected with the Integral P_1 for a Parabolic Boundary	70
CHAPTER V / DEVELOPMENT OF THE FUNCTIONS Ψ , E , F IN TERMS OF EXPONENTIALS MULTIPLIED BY BESSEL FUNCTIONS	72
28. The Transformation of the Differential Equation and its Solution	72
29. Properties of the Functions $q_0(v)$, $q_n(v)$	74
30. The Green's Function Connected with (28.6)	75
31. Summation Formulas	77
32. Series for the Functions ψ , Ψ , θ , ϕ	80
33. Expression for $E(x)$	82
CHAPTER VI / EVALUATION OF INTEGRALS AND SUMS DEPENDING ON THE FUNCTIONS Ψ , E , F	84
34. Basic Definitions	84
35. Initial Integrations and Summations	86
36. Series for the Functions R_m and I_m	90
37. More Summation Formulas	94
38. Continuation from Section 35	97
39. Results Obtained for the Integrals P_0 , P_1 , ... P^*	102
40. Results Obtained for Some Additional Integrals	108
List of Integrals	110
APPENDIX TO CHAPTER VI	112
41. Additional Summation Formulas	112

CHAPTER VII / MEAN VALUES CONNECTED WITH THE SAWTOOTH CURVE OF FIGURE 5	124
42. Recapitulation of Previous Results	124
43. Mean Values Referring to a Single Shock	125
44. Other Mean Values Which can be Expressed in a Simple Way	128
45. The Distribution Function for the Arc Lengths ξ_k	130
CHAPTER VIII / DISTRIBUTION FUNCTIONS REFERRING TO SETS OF TWO CONSECUTIVE ARCS	132
46. Integrals with Two Successive Ψ -Functions	132
47. Weighting Function for the Wavelengths λ_k	135
48. Alternative Expressions for the Functions K^* and L^*	138
49. Relations Involving the Quantity Φ_0	139
50. The Value of Φ_0	141
51. Evaluation of $\langle \xi_k \rangle^*$ for $\lambda \rightarrow 0$	143
52. Calculation of $\langle \xi_k \xi_{k+1} \rangle^*$ for $\lambda \rightarrow 0$	146
53. Calculation of $\langle \xi_k^2 \xi_{k+1} \rangle^*$ for $\lambda \rightarrow 0$	148
54. Application of Expressions (48.5) and (48.6) for K^* and L^*	150
CHAPTER IX / CORRELATION FUNCTIONS AND DISTRIBUTION FUNC- TIONS REFERRING TO SETS OF MORE THAN TWO CONSECUTIVE ARCS	
55. Calculation of $\overline{u_1 u_2}$	152
56. Calculation of $\overline{u_1^2 u_2}$	157
57. Behavior for Small Values of z	159
58. Behavior of the Sums Occurring in Equation (55.18) for Indefinitely In- creasing Values of z	161
59. Behavior of the Sums Occurring in Equation (56.10) or (56.12) for In- definitely Increasing Values of z	165
60. Integrals Referring to a Series of Consecutive Arcs	167
61. Continuation	169
62. The Integrals for the Functions $W_{0i}(z), \dots, W_{3i}(z)$, Introduced in Sec- tions 55 and 56	172
LIST OF PAPERS BY THE AUTHOR, CONNECTED WITH THE PRESENT MONOGRAPH	174