Equations of Mathematical Physics

1. Deduction of the wave equation. String vibration equation.
2. Deduction of the heat equation.
3. Classification of the second order differential equations with partial derivatives of the two independent variables.
4. Statement of the boundary problems. Correctness
5. String vibration equation.
6. Heat equation
7. Laplace equation
8. Adamar's problem
9. Cauchy problem. Characteristics.
10. Hyperbolic type of equation. Cauchy problem for the vibration equation. D'alamber's formula(n=1).
11. Cauchy problem for wave equation (n=2).
12. Theorem about uniqueness of solution of the Cauchy problem.
13. Fourier method (method of separated variables)for the mixed problem for the wave equation.
14. Justification of Fourier method.
15. Non-homogeneous equation of string vibration. Fourier method.
16. Parabolic type. Heat equation.
17. Mixed problem for the heat equation.
18. Maximum principle for heat equation.
19. Theorem of uniqueness of solution of the mixed problem.
20. Cauchy problem for the heat equation.
21. Deduction of the Poisson formula for solution of Cauchy problem.
22. Justification of Poisson formula.
23. Continuous dependence of solution of Cauchy problem of initial data.
24. Physical means of the fundamental solution of Cauchy problem for the heat equation.

25. Elliptic type. Laplace operator.

26. Laplace operator in 3-dimensional space.

27. Laplace operator in 2-dimensional space or plane.

28. Green formula.

29. Integral interpretation of an arbitrary continuous differentiable function.

30. Major property.

31. The major properties of harmonic function on an exterior of domain.

32. Potential.

33. Properties of volume potential.

34. Lapunov surface.

35. Gauss integral.

36. Properties of twice-layer potential.

37. Properties of prime-layer potential.

38. The normal derivative of prime-layer potential.

39. Uniqueness of the intern Dirichlet's problem for Laplace equation.

40. Uniqueness of the extern Dircihlet's problem for the Laplace equation.

41. Green function for Laplace operator.

42. Properties of Green function.

43. Construction of Green function for sphere.

44. Uniqueness of extern Neuman problem.

45. Solution of intern Neuman problem.