# Mathematical Equations and Formulas

1. Quadratic Formula: x = (-b ± √(b² - 4ac)) / 2a

2. Pythagorean Theorem: a² + b² = c²

3. Area of a Circle: A = πr²

4. Circumference of a Circle: C = 2πr

5. Euler's Formula: e^(iπ) + 1 = 0

6. Logarithm Rule: log(ab) = log a + log b

7. Derivative of x^n: d/dx (x^n) = nx^(n-1)

8. Integral of x^n: ∫x^n dx = (x^(n+1))/(n+1) + C

9. Limit Definition: lim(x→a) (f(x) - f(a)) / (x - a)

10. Binomial Theorem: (a + b)^n = Σ (nCk) \* a^(n-k) \* b^k

11. Trigonometric Identity: sin²θ + cos²θ = 1

12. Law of Sines: (sin A)/a = (sin B)/b = (sin C)/c

13. Law of Cosines: c² = a² + b² - 2ab cos C

14. Sum of Arithmetic Series: S\_n = (n/2) \* (2a + (n-1)d)

15. Sum of Geometric Series: S\_n = a(1 - r^n) / (1 - r)

16. Volume of a Sphere: V = (4/3)πr³

17. Surface Area of a Sphere: A = 4πr²

18. Mean (Average): μ = (Σx) / n

19. Variance: σ² = (Σ(x - μ)²) / n

20. Standard Deviation: σ = √σ²

21. Newton's Second Law: F = ma

22. Work Formula: W = Fd cosθ

23. Kinetic Energy: KE = (1/2)mv²

24. Potential Energy: PE = mgh

25. Ohm's Law: V = IR

26. Power Formula: P = VI

27. Heat Energy: Q = mcΔT

28. Wave Equation: v = fλ

29. Momentum: p = mv

30. Ideal Gas Law: PV = nRT

31. Snell's Law: n₁ sinθ₁ = n₂ sinθ₂

32. Coulomb's Law: F = k(q₁q₂) / r²

33. Magnetic Force: F = qvB sinθ

34. Ampere’s Law: ∮B·dl = μ₀I

35. Planck's Equation: E = hf

36. Einstein's Mass-Energy Equation: E = mc²

37. Probability Rule: P(A ∪ B) = P(A) + P(B) - P(A ∩ B)

38. Bayes' Theorem: P(A|B) = P(B|A) P(A) / P(B)

39. Fourier Transform: F(ω) = ∫f(x)e^(-iωx)dx

40. Differential Equation: dy/dx + Py = Q

41. Logarithmic Derivative: d/dx ln(x) = 1/x

42. Exponential Growth: N = N₀e^(rt)

43. Half-Life Formula: t₁/₂ = ln(2)/k

44. Projectile Motion: y = x tanθ - (gx²) / (2v² cos²θ)

45. Vector Magnitude: |A| = √(A₁² + A₂² + A₃²)

46. Vector Dot Product: A·B = |A||B| cosθ

47. Vector Cross Product: A × B = |A||B| sinθ n̂

48. Divergence Theorem: ∫∫∫(∇·F) dV = ∮(F·dS)

49. Stokes' Theorem: ∮(F·dr) = ∬(∇×F)·dS

50. Lagrange's Mean Value Theorem: f'(c) = (f(b) - f(a)) / (b - a)