IB Math Formula Sheet

Key formulas for IB Math AA/AI. Covers algebra, functions, calculus, and statistics for SL and HL.

Sequences & Series

Arithmetic nth: $u_n = u_1 + (n - 1)d$
Arithmetic sum: $S_n = (n/2)(2u_1 + (n - 1)d)$
Or: $S_n = (n/2)(u_1 + u_n)$
Geometric nth: $u_n = u_1 * r^{(n-1)}$
Geometric sum: $S_n = u_1(1 - r^n) / (1 - r)$
Infinite geo: $S = u_1 / (1 - r)$, $|r| < 1$

Exponents & Logarithms

Product: $a^m * a^n = a^{(m+n)}$
Quotient: $a^m / a^n = a^{(m-n)}$
Power: $(a^m)^n = a^{mn}$
Log def: $\log_a(b) = c$ means $a^c = b$
Log product: $\log(ab) = \log(a) + \log(b)$
Log quotient: $\log(a/b) = \log(a) - \log(b)$
Log power: $\log(a^n) = n * \log(a)$
Change of base: $\log_a(b) = \ln(b) / \ln(a)$

Binomial Theorem

Expansion: $(a+b)^n = \text{sum } C(n,r)\, a^{(n-r)}\, b^r$
General term: $T(r+1) = C(n,r) * a^{(n-r)} * b^r$
C(n,r): $n! / (r!(n-r)!)$

Functions

Composite: $(f \circ g)(x) = f(g(x))$
Inverse: $f(f^{-1}(x)) = x$, reflect over $y = x$
Quadratic: $x = (-b \pm (b^2 - 4ac)) / 2a$
Vertex: $x = -b / 2a$
Discriminant: $b^2 - 4ac$ (>0 two, =0 one, <0 none)

Transformations

Vertical shift: $f(x) + k$ (up k units)
Horizontal shift: $f(x - h)$ (right h units)
Vertical stretch: $a * f(x)$ (scale by a)
Horizontal stretch: $f(x/b)$ (scale by b)
Reflection x: $-f(x)$
Reflection y: $f(-x)$

Calculus - Differentiation

Power rule: $d/dx\, [x^n] = nx^{(n-1)}$
Chain rule: $dy/dx = dy/du * du/dx$
Product: $(uv)' = u'v + uv'$
Quotient: $(u/v)' = (u'v - uv') / v^2$
sin(x): $d/dx = \cos(x)$
cos(x): $d/dx = -\sin(x)$
e^x: $d/dx\, [e^x] = e^x$
ln(x): $d/dx = 1/x$

Calculus - Integration

Power: $\int x^n\, dx = x^{(n+1)}/(n+1) + C$
1/x: $\int (1/x)\, dx = \ln|x| + C$
sin(x): $\int \sin(x)\, dx = -\cos(x) + C$
cos(x): $\int \cos(x)\, dx = \sin(x) + C$
e^x: $\int e^x\, dx = e^x + C$
Area: $\int (a \text{ to } b)\, f(x)\, dx$
Between curves: $\int (a \text{ to } b)\, [f(x) - g(x)]\, dx$

Statistics & Probability

Mean: $\bar{x} = (\text{sum of } x_i) / n$
Std dev: $s = [\text{sum}(x_i - \bar{x})^2 / (n - 1)]$
P(A or B): $P(A) + P(B) - P(A \text{ and } B)$
P(A|B): $P(A \text{ and } B) / P(B)$
Expected: $E(X) = \text{sum of } x_i * P(x_i)$

IB gives you a formula booklet during exams, but knowing where each formula is and how to apply it quickly makes the difference.