AP Calculus Formula Sheet

Essential AB/BC formulas for limits, derivatives, integrals, and applications. Master these for exam day.

Limits

Definition: lim(x→c) f(x) = L
Sum: lim[f(x) + g(x)] = lim f(x) + lim g(x)
Product: lim[f(x) * g(x)] = lim f(x) * lim g(x)
Quotient: lim[f(x)/g(x)] = lim f/lim g (g ≠0)
L'Hopital: If 0/0 or inf/inf, lim f/g = lim f'/g'
Squeeze: If g(x) ≤f(x) ≤h(x) and lim g = lim h = L, then lim f = L

Basic Derivatives

Power: d/dx [x^n] = $nx^{(n-1)}$
Constant: d/dx [c] = 0
e^x: d/dx [e^x] = e^x
ln(x): d/dx [ln(x)] = 1/x
a^x: d/dx [a^x] = a^x ln(a)

Integration Rules

Power: ∫x^n dx = $x^{(n+1)}$/(n+1) + C
Constant: ∫c dx = cx + C
1/x: ∫(1/x) dx = ln|x| + C
e^x: ∫e^x dx = e^x + C
sin(x): ∫sin(x) dx = -cos(x) + C
cos(x): ∫cos(x) dx = sin(x) + C
$sec^2(x)$: ∫sec^2(x) dx = tan(x) + C

Integration Techniques

u-sub: ∫f(g(x))g'(x) dx, let u = g(x)
By parts: ∫u dv = uv - ∫v du
Choosing u: LIATE: Log, Inverse trig, Alg, Trig, Exp

Derivative Rules

Sum: (f + g)' = f' + g'
Product: (fg)' = f'g + fg'
Quotient: (f/g)' = (f'g - fg') / g^2
Chain: d/dx [f(g(x))] = f'(g(x)) * g'(x)

Trig Derivatives

sin(x): d/dx = cos(x)
cos(x): d/dx = -sin(x)
tan(x): d/dx = sec^2(x)
sec(x): d/dx = sec(x)tan(x)
csc(x): d/dx = -csc(x)cot(x)
cot(x): d/dx = -csc^2(x)

Fundamental Theorem of Calculus

FTC Part 1: d/dx [∫a to x) f(t) dt] = f(x)
FTC Part 2: ∫a to b) f(x) dx = F(b) - F(a)
Note: F is any antiderivative of f

Applications

Area: ∫a to b) [f(x) - g(x)] dx
Disk: V = π∫a to b) [f(x)]² dx
Washer: V = π∫a to b) [R^2 - r^2] dx
Shell: V = 2π∫a to b) x * f(x) dx
Avg value: f_avg = (1/(b-a)) ∫a to b) f(x) dx
Arc length: L = ∫a to b) (1 + [f'(x)]²) dx

Derivatives and integrals are inverses. If you know one, you can work backwards to find the other. Practice both directions.