Calculus Notes - Derivatives

Basic Derivative Rules:

1. Power Rule: d/dx(x^n) = n*x^(n-1)

2. Product Rule: d/dx(f*g) = f'*g + f*g'

3. Chain Rule: d/dx(f(g(x))) = f'(g(x)) * g'(x)

Examples:

Find the derivative of f(x) = 3x^2 + 2x - 5
Solution: f'(x) = 6x + 2

Find the derivative of g(x) = sin(x^2)
Solution: g'(x) = cos(x^2) * 2x = 2x*cos(x^2)

Integration Techniques

Basic Integration Rules:

1. Power Rule: ∫x^n dx = x^(n+1)/(n+1) + C

2. Substitution: ∫f(g(x))g'(x) dx = ∫f(u) du where u = g(x)

3. Integration by Parts: ∫u dv = uv - ∫v du

Examples:

Evaluate ∫(2x + 3) dx
Solution: x^2 + 3x + C

Evaluate ∫x*e^(x^2) dx
Solution: Let u = x^2, du = 2x dx
∫x*e^(x^2) dx = (1/2)∫e^u du = (1/2)e^(x^2) + C