Calculus

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1 Fundamental Theorem of Calculus

$$\frac{d}{dx}\int_a^x f(t)\ dt = f(x) \tag{1}$$

$$\int_a^b f(x)\ dx = F(b) - F(a) \tag{2}$$

2 Riemann Sums

$$\int_a^b f(t)\ dt = \lim_{n\to\infty}\sum_{k=1}^{n}\Delta x f(x_k) \tag{3}$$

$$\Delta x = \frac{b-a}{n} \tag{4}$$

$$x_k = a + k\Delta x \tag{5}$$

3 Antiderivative

$$\int f(t)\ dt = \int_{F^{-1}(0)}^{x} f(t)\ dt \tag{6}$$

4 Partial Fraction Decomposition

For a rational expression:

$$\frac{p(x)}{q(x)} = \frac{\sum_{i=0}^{m} a_i x^i}{\sum_{j=0}^{n} b_j x^j}$$

Table 1: Partial Fraction Term Lookup

	Factor of q	Partial Fraction Terms
	$x + a$	$\frac{A}{x + a}$
Multiplicity	$(x + a)^n$	$\sum_{k=1}^{n} \frac{A_k}{(x + a)^k}$
Irreducible	$x^n + ax + b$	$\sum_{k=0}^{n-1} \frac{A_k x^k}{x^n + ax + b}$