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Mathematics II

Chapter seven

Partial Fraction

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Partial Fraction

a. When the degree of nominator is less than the degree power of denominator, then:

1. If the denominator are linear factors:

Example: Integrate:

$$\frac{5x - 3}{(x + 1)(x - 3)}$$

2. If the denominator are repeated linear factor:

$$\int \frac{6x + 7}{(x + 2)^2} dx$$

3. If the fraction contain 2nd degree equation:

$$\int \frac{-2x + 4}{(x^2 + 1)(x - 1)^2} dx$$

Method of Partial Fractions ($f(x)/g(x)$ Proper)

1. Let $x - r$ be a linear factor of $g(x)$. Suppose that $(x - r)^m$ is the highest power of $x - r$ that divides $g(x)$. Then, to this factor, assign the sum of the m partial fractions:

$$\frac{A_1}{x - r} + \frac{A_2}{(x - r)^2} + \cdots + \frac{A_m}{(x - r)^m}.$$

Do this for each distinct linear factor of $g(x)$.

2. Let $x^2 + px + q$ be a quadratic factor of $g(x)$. Suppose that $(x^2 + px + q)^n$ is the highest power of this factor that divides $g(x)$. Then, to this factor, assign the sum of the n partial fractions:

$$\frac{B_1x + C_1}{x^2 + px + q} + \frac{B_2x + C_2}{(x^2 + px + q)^2} + \cdots + \frac{B_nx + C_n}{(x^2 + px + q)^n}.$$

- $\int \frac{dx}{x(x^2+1)^2}$

- $\int \frac{x^2+1}{(x-1)(x-2)(x-3)} dx$

- $\int \frac{x-1}{(x+1)^3} dx$