

Math 1432

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Office Hours:

Mondays 1-2pm,
Fridays noon-1pm
(also available by appointment)

Class webpage:

<http://www.math.uh.edu/~bekki/Math1432.html>

Compute: $\int \frac{3x^3 - 2}{x^2 + 4} dx$

Partial Fractions:

Example: $\frac{3}{x} + \frac{4}{x+1} = \frac{3(x+1) + 4x}{x(x+1)} = \frac{7x+3}{x(x+1)}$

What if we have $\frac{7x+3}{x(x+1)}$ and want the original two fractions?

$$\frac{7x+3}{x(x+1)} = \frac{A}{x} + \frac{B}{x+1} = \frac{3}{x} + \frac{4}{x+1}$$

How do we find A and B?

In general, each **linear factor** of the form $(x - \alpha)^k$ in the denominator gives rise to an expression of the form

$$\frac{A_1}{(x - a)} + \frac{A_2}{(x - a)^2} + \dots + \frac{A_k}{(x - a)^k}$$

Give the **form** of the partial fraction decomposition for:

1a.
$$\frac{5x^2 - 6x + 1}{(x + 1)(x + 2)(x + 3)}$$

1b.
$$\frac{2x^2 - 3x + 1}{(x + 1)(x + 2)^2(x + 3)}$$

Rewrite using partial fractions:

$$\frac{5x - 10}{(x - 4)(x + 1)}$$

$$\frac{3x^2 + 20x + 25}{(x-1)(x+2)(x+3)}$$

Popper 13

1. Give the form of the partial fraction decomposition for:

$$\frac{3x^2 + 20x + 25}{(x-1)(x+2)(x+3)^2}$$

Compute:

$$\int \frac{4x + 41}{x^2 + 3x - 10} dx$$

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

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

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

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

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2. Give the form of the PFD for: $\frac{1}{x^2 - x - 6}$

3. Find the PFD for: $\frac{1}{x^2 - x - 6}$

4. Compute: $\int \frac{1}{x^2 - x - 6} dx$

Now, if the denominator has an **irreducible quadratic factor** of the form

$$x^2 + bx + c \text{ then we have a term in the form } \frac{Ax + B}{x^2 + bx + c}$$

Give the form of the PFD for the following:

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

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

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

5. Give the form of the PFD for: $\frac{1}{(x-2)^2(x^2+2)}$

More examples. Give the PFD and then integrate:

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

$$\int \frac{x^2 + 2x + 7}{(x-1)^2(x^2 + 4)} dx$$

$$\int \frac{e^x}{e^{2x} + 5e^x + 6} dx$$

6. If the degree in the numerator of a rational expression is equal or higher than the degree in the denominator, you should do this **first**: