

Partial Fraction Decomposition

In this section you will learn to:

- Recognize partial fraction decompositions of rational expressions.
- Find partial fraction decompositions of rational expressions.

Let's add two rational expressions together.

$$\frac{3}{x-2} + \frac{5}{x+3}$$

Now, let's undo what we just did. Start with the answer and determine the question.

To Decompose $\frac{N(x)}{D(x)}$ into Partial Fractions:

- Divide when improper.
- Factor the denominator.
- Set up appropriate terms as outlined in the following examples.

$$\frac{x^3 + 2x^2 - x + 1}{x^2 + 3x - 4}$$

Distinct Linear Factors

EX 1: Write the partial fraction decomposition of $\frac{x+2}{x^3-9x}$.

Repeated Linear Factors

EX 2: Write the partial fraction decomposition of $\frac{2x-3}{(x-1)^2}$.

Distinct Linear and Quadratic Factors

EX 3: Write the partial fraction decomposition of $\frac{3x^2 + 4x + 4}{x^3 + 4x}$.

Repeated Quadratic Factors

EX 4: Write the partial fraction decomposition of $\frac{x^3 - 4x^2 + 2x - 6}{x(x^2 + 2)^2}$.