Year 2 Pure Chapter 1 – Algebraic Methods

Partial Fractions (Different Factors)

$$\frac{4x}{(x+1)(x-3)}$$

$$4x \equiv \frac{A}{(x+1)} + \frac{B}{(x-3)}$$

$$4x \equiv A(x-3) + B(x+1)$$

Let $x = 3$ Solve for B

Let $x = -1$ Solve for A

Partial Fractions (Double Factors)

$$\frac{14x}{(2x+1)(x+1)^2}$$

$$\equiv \frac{A}{(2x+1)} + \frac{B}{(x+1)} + \frac{C}{(x+1)^2}$$

$$14x \equiv A(x+1)^2 + B(2x+1)(x+1) + C(2x+1)$$

Let $x = -1$ Solve for C

Let $x = -\frac{1}{2}$ Solve for A

Let $x = 0$ Solve for B

Watch Out for Improper Fractions

Numerator power ≥ Denominator power

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

$$3x^2 \geq x^2$$

$\therefore$ Improper Fraction

Dealing with Improper Fractions

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

Step A: Notice that it is improper.

Step B: Long Division.

$3x^2-3x-2 \div x^2-3x+2$

Whole Number 3

Remainder $6x-8$

Step C: Write as a mixed fraction.

$$3 + \frac{6x-8}{(x-1)(x-2)}$$

Step D: Now split into a partial fraction.

$$3 + \frac{A}{(x-1)} + \frac{B}{(x-2)}$$

Proof by Contradiction

- Make am ASSUMPTION
(Opposite to the true statement)

- Show logical steps to reach
contradiction to assumption

- Conclude the original
statement is true

Tips and Information

Rational numbers can be written as $\frac{a}{b}$

Irrational numbers cannot be written as $\frac{a}{b}$

(where a and b are integers in it simplest form)

Greatest odd integer is n then the next odd number is n + 2

If n = even
then any even number is
n = $2k$

If n = odd
then any odd number is
n = $2k$ + 1

Example

Statement: $\sqrt{2}$ is irrational

Assumption: $\sqrt{2}$ is rational

$$\sqrt{2} = \frac{a}{b} simplifed$$

$$2 = \frac{a^2}{b^2}$$

$$2b^2 = a^2$$

$$\therefore\ a^2 = even$$

$$\therefore\ a = even$$

$$2b^2 = a^2$$

$$2b^2 = (2n)^2$$

$$2b^2 = 4n^2$$

$$b^2 = 2n^2$$

$$\therefore b = even$$

a and b are even

$\therefore$ contradicts that

$$\frac{a}{b}\ is\ simplifed$$

$\therefore \sqrt{2}$ is irrational