
P1 Chapter 7: Algebraic Methods

Polynomial Fractions

1 :: Simplifying Algebraic Fractions

Recall that you can simplify fractions by **dividing** the numerator and denominator by a **common factor**.

Hint: To identify common factors we need to factorise first.

$$\frac{x^2 - 1}{x^2 + x} =$$

?

$$\frac{x^2 + 3x + 2}{x + 1} =$$

?

Note: Do not leave 1 in the denominator!

$$\frac{2x^2 + 11x + 12}{x^2 + 9x + 20} =$$

?

Tip: Factorise the easier one first because it provides clues to the factorisation of the other.

$$\frac{4 - x^2}{x^2 + 2x - 8} =$$

?

Tip: $\frac{a-b}{b-a} = -1$

1 :: Simplifying Algebraic Fractions

Recall that you can simplify fractions by **dividing** the numerator and denominator by a **common factor**.

Hint: To identify common factors we need to factorise first.

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

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

Note: Do not leave 1 in the denominator!

$$\frac{2x^2 + 11x + 12}{x^2 + 9x + 20} = \frac{(2x + 3)(x + 4)}{(x + 4)(x + 5)} = \frac{2x + 3}{x + 5}$$

Tip: Factorise the easier one first because it provides clues to the factorisation of the other.

$$\frac{4 - x^2}{x^2 + 2x - 8} = \frac{(2 - x)(2 + x)}{(x + 4)(x - 2)} = -\frac{x + 2}{x + 4}$$

Tip: $\frac{a-b}{b-a} = -1$

Exercise 7.1

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Homework Exercise

1 Simplify these fractions:

a $\frac{4x^4 + 5x^2 - 7x}{x}$

b $\frac{7x^5 - 5x^5 + 9x^3 + x^2}{x}$

c $\frac{-x^4 + 4x^2 + 6}{x}$

d $\frac{7x^5 - x^3 - 4}{x}$

e $\frac{8x^4 - 4x^3 + 6x}{2x}$

f $\frac{9x^2 - 12x^3 - 3x}{3x}$

g $\frac{7x^3 - x^4 - 2}{5x}$

h $\frac{-4x^2 + 6x^4 - 2x}{-2x}$

i $\frac{-x^8 + 9x^4 - 4x^3 + 6}{-2x}$

j $\frac{-9x^9 - 6x^6 + 4x^4 - 2}{-3x}$

2 Simplify these fractions as far as possible:

a $\frac{(x+3)(x-2)}{(x-2)}$

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

c $\frac{(x+3)^2}{(x+3)}$

d $\frac{x^2 + 10x + 21}{(x+3)}$

e $\frac{x^2 + 9x + 20}{(x+4)}$

f $\frac{x^2 + x - 12}{(x-3)}$

g $\frac{x^2 + x - 20}{x^2 + 2x - 15}$

h $\frac{x^2 + 3x + 2}{x^2 + 5x + 4}$

i $\frac{x^2 + x - 12}{x^2 - 9x + 18}$

j $\frac{2x^2 + 7x + 6}{(x-5)(x+2)}$

k $\frac{2x^2 + 9x - 18}{(x+6)(x+1)}$

l $\frac{3x^2 - 7x + 2}{(3x-1)(x+2)}$

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

n $\frac{x^2 + 6x + 8}{3x^2 + 7x + 2}$

o $\frac{2x^2 - 5x - 3}{2x^2 - 9x + 9}$

3 $\frac{6x^3 + 3x^2 - 84x}{6x^2 - 33x + 42} = \frac{ax(x+b)}{x+c}$, where a , b and c are constants.

Work out the values of a , b and c .

(4 marks)

Homework Answers

- 1 **a** $4x^3 + 5x - 7$ **b** $2x^4 + 9x^2 + x$
 c $-x^3 + 4x + \frac{6}{x}$ **d** $7x^4 - x^2 - \frac{4}{x}$
 e $4x^3 - 2x^2 + 3$ **f** $3x - 4x^2 - 1$
 g $\frac{7x^2}{5} - \frac{x^3}{5} - \frac{2}{5x}$ **h** $2x - 3x^3 + 1$
 i $\frac{x^7}{2} - \frac{9x^3}{2} + 2x^2 - \frac{3}{x}$ **j** $3x^8 + 2x^5 - \frac{4x^3}{3} + \frac{2}{3x}$
- 2 **a** $x + 3$ **b** $x + 4$ **c** $x + 3$
 d $x + 7$ **e** $x + 5$ **f** $x + 4$
 g $\frac{x - 4}{x - 3}$ **h** $\frac{x + 2}{x + 4}$ **i** $\frac{x + 4}{x - 6}$
 j $\frac{2x + 3}{x - 5}$ **k** $\frac{2x - 3}{x + 1}$ **l** $\frac{x - 2}{x + 2}$
 m $\frac{2x + 1}{x - 2}$ **n** $\frac{x + 4}{3x + 1}$ **o** $\frac{2x + 1}{2x - 3}$
- 3 $a = 1, b = 4, c = -2$