

 $Head \ to \underline{www.savemyexams.com} \ for \ more \ awe some \ resources$

Edexcel A Level Maths: Pure



2.6 Rational Expressions

Contents

- * 2.6.1 Rational Expressions
- * 2.6.2 Improper Algebraic Fractions



2.6.1 Rational Expressions

Your notes

Rational Expressions (Algebraic Fractions)

What are rational expressions?

- Rational numbers are numbers that can be written as a fraction (quotient)
 Rational comes from ratio a number is rational if it can be written as a ratio of two integers ie a fraction!
- A rational expression is an algebraic fraction
 The ratio between two algebraic expressions (usually polynomials)

RATIONAL NUMBERS

 $\frac{1}{4}$, $\frac{3}{2}$, 3

RATIONAL EXPRESSIONS

$$\frac{x}{5}$$
, $\frac{x^2+1}{x(x^2-4)}$

Copyright © Save My Exams. All Rights Reserve



Factor theorem

• In order to simplify a rational expression you'll need to remember the factor theorem





FACTOR THEOREM

IF f(a)=0 THEN (x-a) IS A FACTOR OF f(x) i.e. f(x)=(x-a)(....)

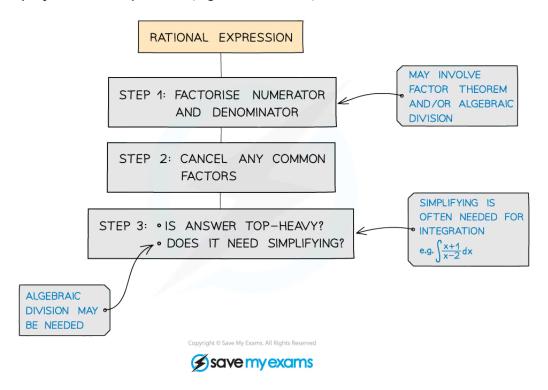
EXTENDED FACTOR THEOREM

IF $f(\frac{b}{a}) = 0$ THEN (ax-b) IS A FACTOR OF f(x) i.e. f(x) = (ax-b) (.....)

Copyright © Save My Exams. All Rights Reserved



How to simplify a rational expression (algebraic fraction)



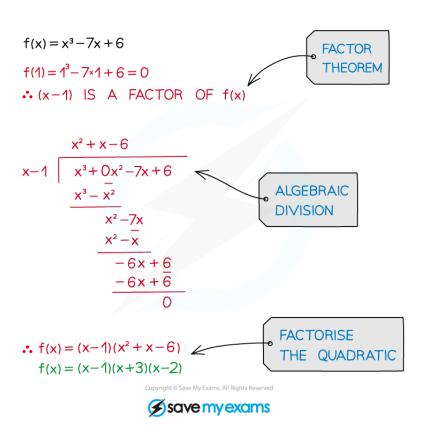
• Start by factorising polynomials using factor theorem or algebraic division

Page 3 of 8

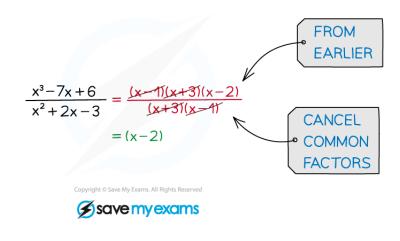


Simplify
$$\frac{x^3 - 7x + 6}{x^2 + 2x - 3}$$





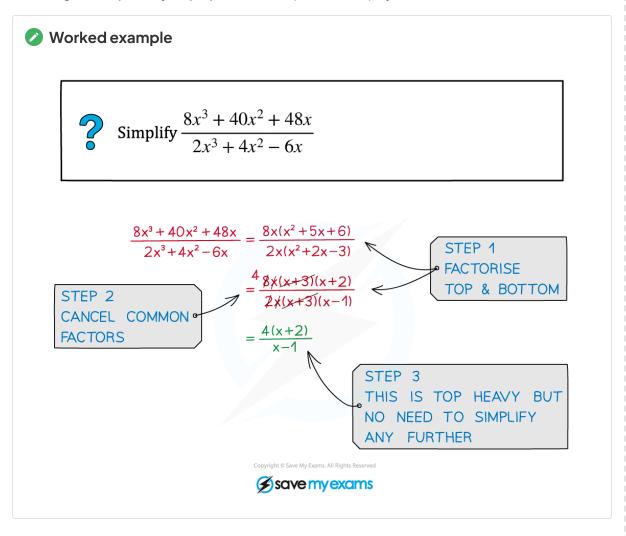
• cancel any common (linear) factors



Page 4 of 8

Your notes

• recognise a top-heavy (improper) rational expression, simplify if needed





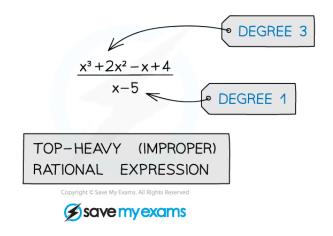
2.6.2 Improper Algebraic Fractions

Your notes

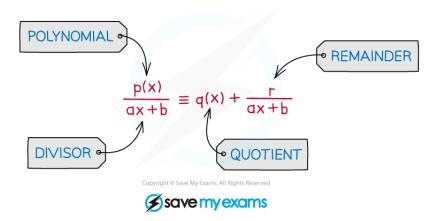
Improper Algebraic Fractions

What are top-heavy (improper) rational expressions (or algebraic fractions)?

• The **degree** of the numerator is **greater than** or **equal** to the degree of the denominator



How do I simplify top-heavy rational expressions?



- Write as a **quotient** and a **remainder**
- The algebraic equivalent of changing a top-heavy fraction to a mixed number

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

$$\begin{array}{c}
x^{2} + 4x + 0 \\
x - 1 \overline{\smash)x^{3} + 3x^{2} - 4x + 2} \\
\underline{x^{3} - x^{2}} \\
4x^{2} - 4x \\
\underline{4x^{2} - 4x} \\
0x + 2 \\
\underline{0x + 0} \\
2
\end{array}$$

STEP 1
DIVIDE TOP BY
BOTTOM USING
ALGEBRAIC DIVISION

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

STEP 2
WRITE ANSWER AS
A QUOTIENT AND
A REMAINDER

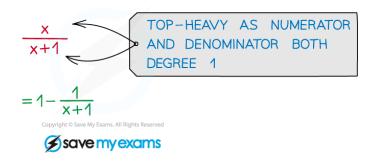
THIS IS THE ALGEBRAIC EQUIVALENT OF MIXED NUMBERS, e.g. $\frac{17}{5} = 3\frac{2}{5}$ (17÷5 = 3 r2)

Copyright © Save My Exams. All Rights Reserve





Remember that simple cases are sometimes the hardest to spot!



Page 7 of 8







Work out $(2x^3 + 5x - 1) \div (x + 2)$

