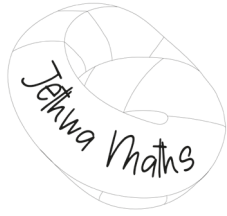


A-Level Starter Activity



Topic: Algebraic Fractions

Chapter Reference: Pure 1, Chapter 7

7
minutes

1. Show that $\frac{1}{2x^2+x-15} \div \frac{1}{3x^2+9x}$ simplifies to $\frac{ax}{bx+c}$, where a , b and c are integers to be found. (2)

2. Solve $\frac{6}{x-1} - \frac{6}{x+1} = 1$ (4)

3. Simplify fully, $\frac{5}{2x-6} - \frac{x+2}{x^2-4x+3}$ (4)

Solutions

1.

$\frac{1}{2x^2+x-15} \div \frac{1}{3x^2+9x}$ $= \frac{1}{(2x-5)(x+3)} \times \frac{3x(x+3)}{1}$	M1
$= \frac{3x}{2x-5}$	M1

2.

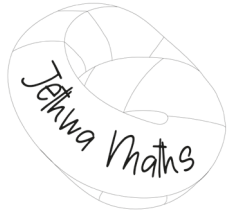
$\frac{6}{x-1} - \frac{6}{x+1} = 1$ $\frac{6(x+1)-6(x-1)}{(x-1)(x+1)} = 1$	M1
$\frac{6x+6-6x+6}{x^2+1} = 1$ $\frac{12}{x^2+1} = 1$	M1
$12 = x^2 + 1$ $x^2 = 11$	M1
$x = \pm \sqrt{11}$	M1

3.

$\frac{5}{2x-6} - \frac{x+2}{x^2-4x+3} = \frac{5}{2(x-3)} - \frac{x+2}{(x-3)(x-1)}$	M1
$= \frac{5(x-1)-2(x+2)}{2(x-3)(x-1)}$ $= \frac{5x-5-2x-4}{2(x-3)(x-1)}$ $= \frac{3x-9}{2(x-3)(x-1)}$	M1
$= \frac{3(x-3)}{2(x-3)(x-1)}$	M1
$= \frac{3}{2(x-1)}$	M1



A-Level Starter Activity



Topic: Dividing Polynomials

Chapter Reference: Pure 1, Chapter 7

6
minutes

1. Find the quotient obtained by dividing $(x^2 + 2x^2 - x - 2)$ by $(x + 1)$ (3)

2. Find the quotient by dividing $(20 + x + 3x^2 + x^3)$ by $(x + 4)$ (4)

Solutions

1.

Attempt to divide **M1**
 x^2 term, **M1**
Full quotient **M1**

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

quotient: $x^2 + x - 2$

2.

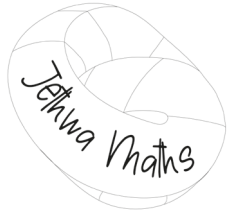
Rewriting $20 + x + 3x^2 + x^3$ as $x^3 + 3x^2 + x + 20$ **M1**
Attempt to divide **M1**
 x^2 term, **M1**
Full quotient **M1**

$$\begin{array}{r} x^2 - x + 5 \\ x + 4 \overline{) x^3 + 3x^2 + x + 20} \\ \underline{x^3 + 4x^2} \\ -x^2 + x \\ \underline{-x^2 - 4x} \\ 5x + 20 \\ \underline{5x + 20} \\ 0 \end{array}$$

quotient: $x^2 - x + 5$



A-Level Starter Activity



Topic: Proof by Counter Example

Chapter Reference: Pure 1, Chapter 7

**6
minutes**

1. 'If m and n are irrational numbers, where $m \neq n$, then mn is also irrational.'

Disprove this statement by means of a counter example.

(2)

2. 'For every real number x , $(x + 1)^2 = x^2 + 1$.'

Disprove this statement by means of a counter example.

3. 'If n is an integer and n^2 is divisible by 4, then n is divisible by 4'.

Disprove this statement by means of a counter example.

Solutions

1.

$3\sqrt{2} = \sqrt{(9)(2)} = \sqrt{18}$	M1
$\sqrt{2} \sqrt{18} = \sqrt{36} = 6$ So if m and n are irrational numbers then mn is not always irrational.	M1

2.

$(x + 1)^2 = x^2 + 1$ When $x = -2$	M1
$(-2 + 1)^2 = (-2)^2 + 1$ $1 \neq 5$ Therefore, proof by counter example.	M1

3.

Consider $n = 6$ (or suitable alternative)	M1
$n^2 = 36$ n^2 is divisible by 4, but n is not. Therefore, proof by counter example.	M1



Solutions

1.

Let $f(x) = x^3 + 2x^2 - 2x - 1$ Find $f(1)$	M1
$f(1) = 1 + 2 - 2 - 1 = 0$ Therefore, $(x - 1)$ is a factor.	M1

2.

Let $f(x) = 2 - 17x + 25x^2 - 6x^3$ Find $f(\frac{2}{3})$	M1
$f(\frac{2}{3}) = 2 - \frac{34}{3} + \frac{100}{9} - \frac{16}{9} = 0$ Therefore $(3x - 2)$ is a factor	M1

3a.

$g(-2) = 0,$ Therefore $(x + 2)$ is a factor of $g(x)$	M1
$\begin{array}{r} x^2 + 5x - 3 \\ x+2 \overline{) x^3 + 7x^2 + 7x - 6} \\ \underline{x^3 + 2x^2} \\ 5x^2 + 7x \\ \underline{5x^2 + 10x} \\ - 3x - 6 \\ \underline{- 3x - 6} \\ 0 \end{array}$ <p style="margin-left: 150px;">Attempt to divide M1 Obtaining $x^2 + 5x - 3$ M1</p>	
Therefore, $g(x) = (x + 2)(x^2 + 5x - 3)$	M1

3b.

Other solutions given by, $x^2 + 5x - 3 = 0$ $x = -5.54, 0.54$	M1
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