1.1 Rational Expressions

Question Paper

Course	Edexcel IAL Maths: Pure 3
Section	1. Algebra & Functions
Topic	1.1 Rational Expressions
Difficulty	Hard

Time allowed: **70**

Score: **/57**

Percentage: **/100**

Question 1

Simplify fully

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

(ii) $\frac{x^3+x}{x^4}$

(iii) $\frac{x^3+3x^2-4x}{x^4-x^3}$

[6 marks]

Question 2

(a) Simplify fully $\frac{x^2+x-2}{x^3+4x^2-4x-1}$

[3 marks]

Question 2

(b) Simplify fully $\frac{3x+9}{x+2} \times \frac{x^2+6x+8}{x+3}$

[3 marks]

Question 2

(c) Simplify fully $\frac{x^2+8x-9}{x^2+7x+12} \div \frac{x^2+11x+18}{2x^2+7x-4}$

[3 marks]

Question 3

The function $f(x)$ is given by

$$f(x) = 4x^3 - 7x^2 - 21x + 18$$

(a) Show that $(4x - 3)$ is a factor of $f(x)$.

[2 marks]

Question 3

(b) Hence, or otherwise, fully factorise $f(x)$.

[4 marks]

Question 3

(c) Write down the roots of $f(x)$.

[2 marks]

Question 4

Show that $(5x - 2)$ is a factor of $25x^3 + 55x^2 - 56x + 12$.

Hence find all the real solutions to the equation $25x^3 + 55x^2 - 56x + 12 = 0$.

[5 marks]

Question 5

(a) Given that $(4x - 5)$ is a factor of $4x^3 - 9x^2 + ax + 30$ find the value of a.

[2 marks]

Question 5

(b) Hence, or otherwise, fully factorise $4x^3 - 9x^2 + ax + 30$.

[2 marks]

Question 6

(a) Work out $(x^3 + 5x^2 - 4) \div (x - 5)$.

[2 marks]

Question 6

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

[2 marks]

Question 7

(i) Find the remainder when $x^3 - 2x^2 + 4x - 3$ is divided by $x - 2$.

(ii) Find the value of f(2) when $f(x) = x^3 - 2x^2 + 4x - 3$.

(iii) Comment on your answers to parts (i) and (ii).

[4 marks]

Question 8

One of the three algebraic fractions below is improper ('top-heavy'):

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

Identify which fraction is improper and write it in the form $Ax+B+\frac{C}{x+1}$, where A, B and C are integers to be found.

[3 marks]

Question 9

(a) Simplify $\frac{x^3-7x^2+14x-8}{x-1}$

[3 marks]

Question 9

(b) Hence solve $\frac{x^3 - 7x^2 + 14x - 8}{x - 1} = 2x^2 - 5x + 2.$

[3 marks]

Question 10

It is given that

$$\frac{f(x)}{g(x)} = 2x + 3 - \frac{4}{x + 1}$$

(a) Why would assuming that $g(x) = x + 1$ be a logical first step in attempting to determine the precise forms of $f(x)$ and $g(x)$?

[1 mark]

Question 10

(b) By first making the assumption from part (a), find $f(x)$.

[2 marks]

Question 10

(c) Explain, with an example, why the forms of $f(x)$ and $g(x)$ determined in parts (a) and (b) are not the only possible forms for those functions.

[2 marks]

Question 11

When $x^3 + ax^2 + 4x - 1$ is divided by $x + 2$ the quotient is $x^2 - 4x + 12$ and the remainder is b.
Find the values of a and b.

[3 marks]