Question	Scheme	Marks	AOs
5(a)	$f(-3)=(-3)^3+3\times(-3)^2-4\times(-3)-12$	M1	1.1b
	$f(-3)=0\Rightarrow(x+3)$ is a factor $\Rightarrow$ Hence $f(x)$ is divisible by $(x+3)$.	A1	2.4
		(2)	
(b)	$x^3+3x^2-4x-12=(x+3)\left(x^2-4\right)$	M1	1.1b
	$=(x+3)(x+2)(x-2)$	dM1 A1	1.1b 1.1b
		(3)	
(c)	$\dfrac{x^3+3x^2-4x-12}{x^3+5x^2+6x}=\dfrac{....}{x\left(x^2+5x+6\right)}$	M1	3.1a
	$=\dfrac{(x+3)(x+2)(x-2)}{x(x+3)(x+2)}$	dM1	1.1b
	$=\dfrac{(x-2)}{x}=1-\dfrac{2}{x}$	A1	2.1
		(3)	
			(8 marks)

Notes:

(a)

M1: Attempts $f(-3)$

A1: Achieves $f(-3)=0$ and explains that $(x+3)$ is a factor and hence $f(x)$ is divisible by $(x+3)$.

(b)

M1: Attempts to divide by $(x+3)$ to get the quadratic factor.

By division look for the first two terms. ie x^2+0x

$$x+3\overline{)\,x^3+3x^2-4x-12}\quad x^2\pm 0x.....$$
$$\underline{x^3+3x^2}$$

By inspection look for the first and last term $x^3+3x^2-4x-12=(x+3)\left(x^2+..x\pm 4\right)$

dM1: For an attempt at factorising their $\left(x^2-4\right)$. (Need to check first and last terms)

A1: $f(x)=(x+3)(x+2)(x-2)$

(c)

M1: Takes a common factor of *x* out of the denominator and writes the numerator in factors.

Alternatively rewrites to $x^3+3x^2-4x-12=A\left(x^3+5x^2+6x\right)+B\left(x^2+5x+6\right)$

dM1: Further factorises the denominator and cancels

Alternatively compares terms or otherwise to find either *A* or *B*

A1: Shows that $\dfrac{x^3+3x^2-4x-12}{x^3+5x^2+6x}=1-\dfrac{2}{x}$ with no errors or omissions

In the alternative there must be a reference to

$x^3+3x^2-4x-12 \equiv 1\left(x^3+5x^2+6x\right)-2\left(x^2+5x+6\right)$ and hence $\dfrac{x^3+3x^2-4x-12}{x^3+5x^2+6x}=1-\dfrac{2}{x}$