Question Number	Scheme	Marks
3.(i)	Sets $f(-2)=0 \Rightarrow 4(-2)^3+6(-2)+k=0 \Rightarrow k=44$	M1, A1
	Attempts $f(5)=4x^3+6x+'44'=4\times5^3+6\times5+'44'=574$	dM1, A1
		(4)
(ii)	Sets $6x^3-15x^2-21x+8=\left(Ax^2+Bx+C\right)(2x+3)+R$	
	And attempts to find values of A, B, C and R via inspection/ substitution etc	M1
	Two correct of A, B, C and R	A1
	$Q(x)=3x^2-12x+\frac{15}{2}$ $\quad R=-\frac{29}{2}$	A1
		(3)
		(7 marks)

(i) M1: Sets $f(\pm2)=0 \rightarrow$ leading to a value for k

Uses Polynomial Division:

$$x+2\overline{)4x^3+0x^2+6x+k} \quad \begin{matrix}4x^2+8x+32\\ \\ \end{matrix} \qquad \text{Rem} = k-44=0 \Rightarrow k=44$$

Allow for $4x^2+\alpha x+\beta$ with a remainder $k\pm\phi=0$

A1: $k=44$ seen or implied

dM1: Attempts $f(\pm5)$ with their value for k leading to a value for the remainder.

Uses Polynomial division

$$x-5\overline{)4x^3+\left(0x^2\right)+6x+'44'} \quad \begin{matrix}4x^2+20x+106\\ \\ \end{matrix} \qquad \text{Rem} = 574 \text{ or Rem} = 530+k$$

Allow for $4x^2+\mu x+\nu$ with a constant remainder

A1: 574

(ii) M1: Full attempt to find both the quotient and remainder.

See main scheme but valid via division. Look for a 3 term quadratic quotient and a constant remainder

Alt - uses polynomial division

Look for a 3-term quadratic quotient and a constant remainder

$$2x+3\overline{)6x^3-15x^2-21x+8} \quad \begin{matrix}3x^2-12x+\frac{15}{2}\\ \\ \end{matrix} \qquad r=-\frac{29}{2}$$

A1: 2 correct terms of the 4 terms in $Q(x)=3x^2-12x+\frac{15}{2}$ and $R=-\frac{29}{2}$

A1: $Q(x)=3x^2-12x+\frac{15}{2}$ and $R=-\frac{29}{2}$ correctly labelled and identified. Allow Quotient (or even Q) in place of Q(x)

Question Number	Scheme	Marks
4.	$\int \left(\frac{12}{x^2}+4\right)\mathrm{d}x = -\frac{12}{x}+4x$ Sets $\int_k^{2k}\left(\frac{12}{x^2}+4\right)\mathrm{d}x = 14 \Rightarrow \left[-\frac{12}{x}+4x\right]_k^{2k} = 14$ $\left(-\frac{6}{k}+8k\right)-\left(-\frac{12}{k}+4k\right)=14 \Rightarrow 2k^2-7k+3=0$ o.e. $(2k-1)(k-3)=0 \Rightarrow k=\frac{1}{2},3$	M1 dM1, A1 ddM1, A1 **(5 marks)**

M1: Attempts to integrate with one index correct

dM1: Applies the limits either way around with a subtraction, **and** sets = 14

A1: Forms a correct 3TQ. Terms do not need to be on the same side of the = sign.

Look for $4k^2+6=14k$ o.e

ddM1: Uses any method of solving a 3TQ including a calculator.

A1: $k=\frac{1}{2},3$ following all previous marks.