Question	Scheme	Marks
8(a)	$\int 17+2x-3x^2\ \mathrm{d}x = 17x+\frac{2x^2}{2}-\frac{3x^3}{3}+k$	M1A1
	$0=\left(17\times(-1)+\frac{2\times(-1)^2}{2}-\frac{3\times(-1)^3}{3}\right)+k \Rightarrow k=15$	M1
	$y=15+17x+x^2-x^3$	A1 [4]
(b)	$\frac{(15+17x+x^2-x^3)}{(x+1)}=-x^2+2x+15$	M1A1
	$-x^2+2x+15=(x+3)(5-x)$	M1A1
	$a=-3,\ [-1]$ and $b=5$	A1
	When $x=0$ $y=15$ so $c=15$	B1 [6]
(c)	$\int_0^5 (15+17x+x^2-x^3)\ \mathrm{d}x-\frac{1}{2}\times5\times15$	M1
	OR	
	$\int_0^5 (15+17x+x^2-x^3)\ \mathrm{d}x-\int_0^5 (15-3x)\ \mathrm{d}x$	
	$\int_0^5 (15+17x+x^2-x^3)\ \mathrm{d}x=\left[15x+\frac{17x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\right]_0^5$	M1
	$\left(15\times5+\frac{17\times5^2}{2}+\frac{5^3}{3}-\frac{5^4}{4}\right)-(0)=\left(\frac{2075}{12}\right)$	M1
	Area of triangle	
	Area $=\frac{1}{2}\times5\times15=37.5$	B1
	OR	
	Area $=\int_0^5 (15-3x)\ \mathrm{d}x=\left[15x-\frac{3x^2}{2}\right]_0^5=37.5$	[B1]
	For the correct area of $R=\frac{2075}{12}-37\frac{1}{2}=\frac{1625}{12}=135\frac{5}{12}$	A1 [5]
		Total 15 marks

Question	Notes	Marks
8(a)	$f'(x)=17+2x-3x^2$	
	For an attempt to integrate $f'(x)$ $y=17x+\frac{2x^2}{2}-\frac{3x^3}{3}+(k)$	M1
	For the correct integral **including** a constant of integration $y=17x+\frac{2x^2}{2}-\frac{3x^3}{3}+k$	A1
	For substituting $(-1\ ,0)$ into their integrated expression, which must include a constant of integration. $0=\left(17\times(-1)+\frac{2\times(-1)^2}{2}-\frac{3\times(-1)^3}{3}\right)+k\Rightarrow(k=15)$	M1
	For writing the equation in the required form $y=15+17x+x^2-x^3$ * **This is a given equation. Every step above must be seen for the award of full marks.**	A1 cso [4]
(b)	Divides $(15+17x+x^2-x^3)$ by $(x+1)$ $x+1\overline{)15+17x+x^2-x^3}$ with quotient $Q+2x+x^2$ **OR** Equates coefficients $(15+17x+x^2-x^3)=(x+1)(Ax^2+Bx+c)\Rightarrow(x+1)(-x^2+2x+Q)$ Where Q is a constant **Minimal working here is sight of the quadratic factor.**	M1
	For obtaining the correct 3TQ $-x^2+2x+15$	A1
	For factorising their 3TQ [or otherwise solving] $-x^2+2x+15=(x+3)(5-x)$	M1A1
	For $a=-3,\ [-1]$ and $b=5$ identified clearly.	A1
	SC No working seen [use of a root finder on a calculator]	
	For $(x+1)(x-5)(x+3)$ seen leading to $a=-3$ and $b=5$ with no working award: M0A0MA1A1	
	For $a=-3$ and $b=5$ seen with no other working seen award: M0A0M0A0A1	
	For the value of $c=15$	B1
(c)	For writing a correct expression for the area of R with the correct limits $\int_0^5(15+17x+x^2-x^3)\ \mathrm{d}x-\frac{1}{2}\times5\times15$ OR	M1

	$\int_0^5 \left(15+17x+x^2-x^3\right)\ \mathrm{d}x - \int_0^5 \left(15-3x\right)\ \mathrm{d}x$	
	For an attempt to integrate the expression for the curve. [Ignore limits for this mark] Area = $\int_0^5 \left(15+17x+x^2-x^3\right)\ \mathrm{d}x = \left[15x+\frac{17x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\right]_0^5$	M1
	For evaluating their integral using their limits. Area = $\left(15\times5+\frac{17\times5^2}{2}+\frac{5^3}{3}-\frac{5^4}{4}\right)-(0)=\left(\frac{2075}{12}\right)$	M1
	For the area of the triangle Area $=\frac{1}{2}\times5\times15=37.5$ **ALT** Integrates the line Area = $\int_0^5 \left(15-3x\right)\ \mathrm{d}x = \left[15x-\frac{3x^2}{2}\right]_0^5 = 37.5$	B1 [B1]
	For the correct area of R $\frac{2075}{12}-37\frac{1}{2}=\frac{1625}{12}=135\frac{5}{12}$	A1 [5]
	ALT	
	For writing an expression for the area of R with the correct limits. $\int_0^5 \left(15+17x+x^2-x^3\right)\ \mathrm{d}x - \int_0^5 \left(15-3x\right)\ \mathrm{d}x = \left[\int_0^5 \left(20x+x^2-x^3\right)\ \mathrm{d}x\right]$ Award the B mark for a correct expression for the combined area.	M1 B1
	For an attempt to integrate the expression for the combined area or just the curve. [Ignore limits for this mark] Area = $\int_0^5 \left(20x+x^2-x^3\right)\ \mathrm{d}x = \left[\frac{20x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\right]_0^5$	M1
	For evaluating their integral using their limits, but the lower limit must be 0. Area = $\left(\frac{20\times5^2}{2}+\frac{5^3}{3}-\frac{5^4}{4}\right)=\left(\frac{1625}{12}\right)$	M1
	For the correct final area.	A1 [5]
		Total 15 marks