Question Number	Scheme	Marks
8.(i)	$\int \frac{2}{3x-1}\,\mathrm{d}x = \frac{2}{3}\ln(3x-1)$	M1 A1
	$\int_3^{42} \frac{2}{3x-1}\,\mathrm{d}x = \frac{2}{3}\ln(125) - \frac{2}{3}\ln(8) = \ln\frac{25}{4}$	dM1 A1
		(4)
(ii)	$\frac{2x^3-7x^2+8x+1}{(x-1)^2} = 2x + B + \frac{C}{(x-1)^2}$	B1
	Full method to find values of A, B and C	M1
	$\frac{2x^3-7x^2+8x+1}{(x-1)^2} = 2x - 3 + \frac{4}{(x-1)^2}$	A1
	$\int \mathrm{h}(x)\,\mathrm{d}x = \int Ax + B + \frac{C}{(x-1)^2}\,\mathrm{d}x$	
	$= \frac{1}{2}Ax^2 + Bx - \frac{C}{(x-1)}$	M1 A1 ft
	$= x^2 - 3x - \frac{4}{(x-1)} \quad (+c)$	A1
		(6)
		10 marks
(ii) Alt I first 3 marks	$2x^3-7x^2+8x+1 = Ax(x-1)^2 + B(x-1)^2 + C$	
	Any of $A=2, B=-3$, or $C=4$	B1
	Either substitution or equating coefficients to get two values	M1
	All values correct $A=2, B=-3, C=4$	A1
		(3)
(ii) Alt II first 3 marks	$\begin{array}{r} 2x-3 \\ x^2-2x+1 \overline{\big)\, 2x^3-7x^2+8x+1} \\ \underline{} \\ 4 \end{array}$	
	Likely to be $2x$	B1
	For attempt at division	M1
	Correct quotient and remainder	A1
		(3)

(i)

M1 Integrates to $k\ln(3x-1)$ condoning slips. Condone with a missing bracket.

Please note that $k\ln(3ax-a)$ where a is a positive constant is also correct

If a substitution is made, i.e $u=3x-1,$ then they must proceed to $k\ln u$ where k is a constant

A1 $\frac{2}{3}\ln(3x-1)$

Also accept $\frac{2}{3}\ln(3ax-a)$ where a is a positive constant is also correct or $\frac{2}{3}\ln u$ where $u=3x-1,$

Do not allow with the missing bracket unless subsequent work implies that it is present

dM1 Substitutes in both limits and applies one ln law correctly. May be subtraction law or power law.

If a substitution has been made then the correct limits must be used. With u they are 125 and 8

A1 $\ln\frac{25}{4}$ or simplified equivalent such as $\ln 25-\ln 4$, $2\ln 5-2\ln 2$ or $2\ln\frac{5}{2}$

ISW if followed by decimals

(ii)

B1 Any correct value of A, B or C seen or implied.

M1 A full method to find values of A, B and C.

If they attempt $2x^3-7x^2+8x+1=Ax(x-1)^2+B(x-1)^2+C$ via this route, this expression must be correct.

If they attempt by division then they must proceed to a linear quotient but may get a linear remainder.

A1 Correct A, B, C or correct expression. This may be implied by a correct quotient and remainder.

M1 $\int\frac{P}{(x-1)^2}\,\mathrm{d}x\to\frac{Q}{(x-1)^1}$ o.e. where P and Q could be the same

Award for $\int\frac{P}{(x-1)^2}\,\mathrm{d}x\to\frac{Q}{u}$ where they have previously set $u=x-1$

A1ft $\int Ax+B+\frac{C}{(x-1)^2}\,\mathrm{d}x=\frac{1}{2}Ax^2+Bx-\frac{C}{(x-1)}$ or unsimplified equivalent.

So allow $\frac{1}{2}Ax^2+Bx+\frac{C}{-1}(x-1)^{-1}$ with the indices processed

Also allow with non-numerical values.

Also score for $\int Ax+B+\frac{C}{(x-1)^2}\,\mathrm{d}x=\frac{1}{2}Ax^2+Bx-\frac{C}{u}$ where they have previously set $u=x-1$

A1 $x^2-3x-\frac{4}{(x-1)}\quad(+c)$ or exact simplified equivalent with or without the $+c$

So allow $x^2-3x-4(x-1)^{-1}\quad(+c)$

Question Number	Scheme	Marks
9.(a)	$R=\sqrt{41}$	B1
	$\tan\alpha=\frac{4}{5}\Rightarrow\alpha=$ awrt 0.675	M1A1
		(3)
(b)	(i) Describes stretch: stretch in the y direction by "$\sqrt{41}$"	B1 ft
	(ii) Describes translation: E.g. translate by $\begin{pmatrix}-\arctan\frac{4}{5}\\0\end{pmatrix}$	B1 ft
		(2)
(c)	Attempts either $\mathrm{g}(\theta)=\frac{90}{4+\left(\sqrt{41}\right)^2}$ OR $\mathrm{g}(\theta)=\frac{90}{4}$	M1
	Range $2\leqslant \mathrm{g}(\theta)\leqslant 22.5$	A1
		(2)
		7 marks

(a)

B1 $R=\sqrt{41}$

Condone $R=\pm\sqrt{41}$ (Do not allow decimals for this mark Eg 6.40 but remember to isw after $\sqrt{41}$)

M1 $\tan\alpha=\pm\frac{4}{5},\ \tan\alpha=\pm\frac{5}{4}\Rightarrow\alpha=...$ Condone $\sin\alpha=4,\ \cos\alpha=5\Rightarrow\tan\alpha=\frac{4}{5}$

If R is used to find α accept $\sin\alpha=\pm\frac{4}{R}$ or $\cos\alpha=\pm\frac{5}{R}\Rightarrow\alpha=...$

A1 $\alpha=$ awrt 0.675 Note that the degree equivalent $\alpha=$ awrt $38.7°$ is A0

(b)(i)

B1ft Fully describes the stretch. Follow through on their R. **Requires the size and the direction**

Allow responses such as

- stretch in the y direction by "$\sqrt{41}$"
- multiplies all the y coordinates/values by "$\sqrt{41}$"
- stretch in ↑ direction by "$\sqrt{41}$"
- vertical stretch by "$\sqrt{41}$"
- Scale Factor "$\sqrt{41}$" in just the y direction

Do **not** award for y is translated/transformed by "$\sqrt{41}$"