Question Number	Scheme	Marks
8 (i)	$\int \frac{8\sqrt{x}-5}{2x^2}\,\mathrm{d}x = \int 4x^{-\frac{3}{2}} - \frac{5}{2}x^{-2}\,\mathrm{d}x$	B1
	$= -8x^{-\frac{1}{2}} + \frac{5}{2}x^{-1}\ (+C)$	M1 A1
	$\int_2^4 \left(4x^{-\frac{3}{2}} - \frac{5}{2}x^{-2}\right)\mathrm{d}x = \left(-4+\frac{5}{8}\right) - \left(-4\sqrt{2}+\frac{5}{4}\right) = 4\sqrt{2} - \frac{37}{8}$	dM1 A1
		(5)
(ii)	$\int \left(\frac{1}{2}x^2 + k\right)\mathrm{d}x = \left[\frac{1}{6}x^3 + kx\right]$	M1 A1
	$\int_{-3}^{6}\left(\frac{1}{2}x^2+k\right)\mathrm{d}x = 55 \Rightarrow \left[\frac{1}{6}x^3+kx\right]_{-3}^{6} = 55 \Rightarrow (36+6k) - \left(-\frac{9}{2}-3k\right) = 55 \Rightarrow k = \ldots$	dM1
	$k = \frac{29}{18}$	A1
		(4)
		(9 marks)

(i)

B1 For $\frac{8\sqrt{x}-5}{2x^2} \to 4x^{-\frac{3}{2}} - \frac{5}{2}x^{-2}$ (seen or implied). Ignore any $+C$

You may also see a factor of ½ taken out eg $\frac{8\sqrt{x}-5}{2x^2} \to \frac{1}{2}\left(8x^{-\frac{3}{2}} - 5x^{-2}\right)$

M1 For raising any index by one on one of their terms. Follow through on incorrect indices but do not allow for candidates who attempt to integrate the numerator and denominators separately.

A1 Correct terms (may be unsimplified but the indices must be processed)

dM1 Substitutes 4 and 2 into an integrated function and subtracts either way round. Dependent on the previous method mark. awrt 1.03 following B1M1A1 is sufficient evidence to award this mark.

A1 $4\sqrt{2} - \frac{37}{8}$ or exact equivalent (eg $4\sqrt{2} - 4.625$ or $\frac{32\sqrt{2}-37}{8}$)

Note: Answer only scores 0 marks.

(ii)

M1 Attempts to integrate $\left(\frac{1}{2}x^2 + k\right)$ with one term correct unsimplified so allow eg $\frac{\frac{1}{2}x^3}{3}$ or kx^1 but the index must be processed.

A1 $\frac{1}{6}x^3 + kx$ (allow unsimplified equivalent expressions as above)

dM1 Substitutes 6 and -3 into $Ax^3 + kx$, subtracts, sets $= 55$ and proceeds to $k = \ldots$. Do not be concerned with the mechanics of their rearrangement.

A1 $k = \frac{29}{18}$ or exact equivalent eg $1.61\dot{1}$ but do not allow 1.6 or 1.61 or 1.61….

Question Number	Scheme	Marks
9.(i)	$3\sin(2\theta-10°)=1\Rightarrow(2\theta-10°)=\arcsin\left(\frac{1}{3}\right)$	M1
	$\theta=\frac{19.47+10}{2},\frac{160.53+10}{2}$	dM1
	$\theta=$ awrt $14.7°, 85.3°$	A1, A1 **(4)**
(ii) (a)	Writes $\frac{1}{\tan\alpha}-\sin\alpha=2\sin\alpha-\frac{1}{\tan\alpha}$ oe	M1
	$\frac{2}{\tan\alpha}=3\sin\alpha\Rightarrow\frac{2\cos\alpha}{\sin\alpha}=3\sin\alpha\Rightarrow2\cos\alpha=3\sin^2\alpha$ *	dM1 A1* **(3)**
(b)	$2\cos\alpha=3\sin^2\alpha\Rightarrow2\cos\alpha=3(1-\cos^2\alpha)$	M1
	$3\cos^2\alpha+2\cos\alpha-3=0$	A1
	Attempts to solve $3\cos^2\alpha+2\cos\alpha-3=0\Rightarrow\cos\alpha=\frac{-2\pm\sqrt{40}}{6}$ oe	dM1 A1
	$\alpha=5.517$ radians	A1 **(5)** **(12 marks)**

(i)

M1 For proceeding to $x=\arcsin\left(\frac{1}{3}\right)$ which may be implied by the sight of awrt $19.5°$ or awrt $160.5°$
(Allow awrt 0.340 (radians) for this mark)

dM1 For correct order of operations leading to one answer for θ. May be implied by $14.7°/14.8°$ but cannot be scored by adding 10 to an angle in radians but may be implied by awrt $0.257/0.258$ rad

A1 One of $\theta=$ awrt $14.7°, 85.3°$ ignore any others.

A1 Both of $\theta=$ awrt $14.7°, 85.3°$ and no others in the range.

Note that solutions based entirely on graphical or numerical methods are not acceptable so answers only will score 0 marks.

(ii)(a)

M1 Uses the terms of an AP to set up a correct equation. Eg $\frac{1}{\tan\alpha}-\sin\alpha=2\sin\alpha-\frac{1}{\tan\alpha}$, $\frac{\cos\alpha}{\sin\alpha}-\sin\alpha=2\sin\alpha-\frac{\cos\alpha}{\sin\alpha}$. They may also do $2\left(\frac{1}{\tan\alpha}-\sin\alpha\right)=2\sin\alpha-\sin\alpha$. Condone mixed variables and poor notation for the method marks.