Question	Scheme	Marks
2(a)	$AB = 21\text{ cm}, BC = 13\text{ cm}, \angle BAC = 25°, \angle ACB = x°$	
	$\frac{\sin x°}{21} = \frac{\sin 25°}{13}$ o.e	M1
	$\sin x° = 0.6827$ (awrt)	A1
		(2)
(b)	$\sin^{-1}(0.6827) = \ldots (43.05°)$	M1
	($AC < AB$ so $\angle ABC < \angle ACB$ so) required angle is $180° - \sin^{-1}(0.6827) = \ldots$	M1
	So $x =$ awrt 136.95	A1
		(3)
		(5 marks)
Notes:		
Condone the omission of the ° symbol. Mark (a) and (b) as one		

Question Number	Scheme	Marks
2. (a)	$5(x+3) > 4(2x-5) \Rightarrow 5x+15 > 8x-20 \Rightarrow ax > b$ or $px < q$	M1
	$\Rightarrow x < \frac{35}{3}$	A1
		(2)
(b) (i)	$x^2 - 6x + 1 = (x-3)^2 \pm \ldots = (x-3)^2 - 8$	M1, A1
(ii)	$(x-3)^2 - 8 = 0 \Rightarrow x = 3 + \sqrt{8}$ or $3 - \sqrt{8}$	M1
	$x^2 - 6x + 1 \geqslant 0 \Rightarrow x \leqslant 3 - \sqrt{8}, x \geqslant 3 + \sqrt{8}$	A1
		(4)
(c)	$x \leqslant 3 - \sqrt{8},\ 3 + \sqrt{8} \leqslant x < \frac{35}{3}$	B1
		(1)
		(7 marks)

Question Number	Scheme	Marks
2 (a)	$3^{3x} = (3^x)^3 = y^3$	B1
		(1)
(b)	$\frac{1}{3^{x-2}} = \frac{1}{3^x \times 3^{-2}} = \frac{9}{y}$	M1 A1
		(2)
(c)	$\frac{81}{9^{2-3x}} = \frac{9^2}{9^{2-3x}} = 9^{2-(2-3x)} = 9^{3x} = 3^{6x} = y^6$	M1 A1
		(2)
		(5 marks)

Question Number	Scheme	Marks
	$\int (2x-5)(3x+2)(2x+5)\,dx$	
1.	$(2x-5)(3x+2)(2x+5)=(6x^2-11x-10)(2x+5)=...$	M1
	$=12x^3+8x^2-75x-50$	A1
	$\int (2x-5)(3x+2)(2x+5)\,dx = 3x^4+\frac{8}{3}x^3-\frac{75}{2}x^2-50x+c$	M1, A1ft, A1
		(5 marks)

Question Number	Scheme	Marks
4(i)	Uses a correct law of indices on 2^{4k-3} or 8^{1-k} The possibilities are endless but some more common examples are: For 2^{4k-3}: $2^{4k}\times 2^{-3}$, $\frac{2^{4k}}{8}$, $8^{\frac{4k-3}{3}}$, $4^{\frac{4k-3}{2}}$, $\left(\sqrt{2}\right)^{8k-6}$ For 8^{1-k}: 8×8^{-k}, $\frac{8}{8^k}$, $2^{3(1-k)}$, $4^{\frac{2(1-k)}{3}}$, $\left(\sqrt{2}\right)^{6-6k}$ These may be seen in isolation e.g. not in an equation. But not just e.g. $8=2^3$	M1
	e.g. $2^{4k-3}=\frac{8^{1-k}}{4\sqrt{2}}\Rightarrow 2^{4k-3}=\frac{2^{3(1-k)}}{2^{\frac{5}{2}}}\Rightarrow 2^{4k-3}=2^{3(1-k)-\frac{5}{2}}$ $\Rightarrow 4k-3=3(1-k)-\frac{5}{2}\Rightarrow k=...$	dM1
	$k=\frac{1}{2}$	A1
		(3)
(ii)	$\frac{x\sqrt{3}+2}{\sqrt{3}-1}=x\sqrt{3}-4\Rightarrow x\sqrt{3}+2=\left(x\sqrt{3}-4\right)\left(\sqrt{3}-1\right)$ $\Rightarrow x\sqrt{3}+2=3x+4-4\sqrt{3}-x\sqrt{3}$ $\Rightarrow 2\sqrt{3}x-3x=2-4\sqrt{3}$	M1
	$\Rightarrow x\left(2\sqrt{3}-3\right)=2-4\sqrt{3}$	A1
	$\Rightarrow x=\frac{2-4\sqrt{3}}{2\sqrt{3}-3}\times\frac{2\sqrt{3}+3}{2\sqrt{3}+3}$	dM1
	$=-6-\frac{8}{3}\sqrt{3}$	A1
		(4)

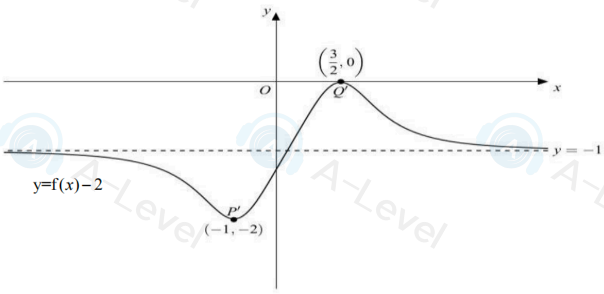
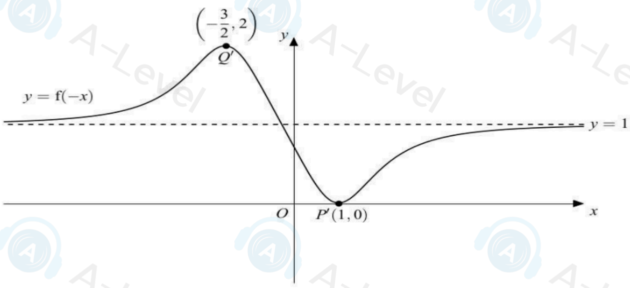
Question Number	Scheme	Marks
4	$\int \frac{3x^{\frac{3}{2}}-15x^{\frac{1}{2}}+2x-10}{4\sqrt{x}}\,dx = \int \frac{3}{4}x-\frac{15}{4}+\frac{1}{2}x^{\frac{1}{2}}-\frac{5}{2}x^{-\frac{1}{2}}\,dx$	M1A1A1
	$x^n \to x^{n+1}$	dM1
	$\frac{3}{8}x^2-\frac{15}{4}x+\frac{1}{3}x^{\frac{3}{2}}-5x^{\frac{1}{2}}+C$	A1A1
		(6 marks)

Question Number	Scheme	Marks
8 (a) (i)	$x=4, f'(x)=10,\ f'(x)=3\sqrt{x}+kx^2 \Rightarrow 10=3\sqrt{4}+4^2k \Rightarrow k=...$	M1
	$10=3\times2+k\times16 \Rightarrow k=\frac{1}{4}$ *	A1*
(ii)	$x=4, y=12$ on $y=10x+c \Rightarrow 12=10\times4+c$	M1
	$\Rightarrow c=-28$	A1
		(4)
(b)	$f''(x)=\frac{3}{2}x^{-\frac{1}{2}}+\frac{1}{2}x$	M1 A1ft
	$\{\Rightarrow f''(4)\}=\frac{11}{4}$	A1
		(3)
(c)	$f(x)=2x^{\frac{3}{2}}+\frac{1}{12}x^3+d$	M1, A1ft
	Uses $P(4,12) \Rightarrow 12=2\times8+\frac{1}{12}\times4^3+d \Rightarrow d=...$	dM1
	$\{f(x)=\}\,2x^{\frac{3}{2}}+\frac{1}{12}x^3-\frac{28}{3}$	A1
		(4) **(11 marks)**

Question Number	Scheme	Marks
5.(a)	$\frac{dy}{dx}=\frac{1}{2}x^2+2x^{-\frac{1}{2}}$	M1A1 A1
		(3)
(b)	$\left.\frac{dy}{dx}\right\|_{x=4}=\frac{1}{2}\times4^2+2\times\frac{1}{\sqrt{4}}=(9)$	M1
	Gradient of normal is $-\frac{1}{9}$	dM1
	$y-\frac{11}{3}=-\frac{1}{9}(x-4) \Rightarrow x+9y-37=0$	M1 A1
		(4) **(7 marks)**

Question	Scheme	Marks
1	$4x^2-3x+7 \geqslant 4x+9$ $\Rightarrow 4x^2-7x-2 ... 0 \Rightarrow (4x+1)(x-2) ... 0 \Rightarrow x = ...$ or $\Rightarrow 4x^2-7x-2 ... 0 \Rightarrow x = \frac{-(-7)\pm\sqrt{(-7)^2-4(4)(-2)}}{2\times 4} \Rightarrow x = ...$ or $\Rightarrow 4x^2-7x-2 ... 0 \Rightarrow 4\left(x^2-\frac{7}{4}x-\frac{1}{2}\right) ... 0 \Rightarrow 4\left(\left(x-\frac{7}{8}\right)^2-\left(\frac{7}{8}\right)^2-\frac{1}{2}\right) ... 0 \Rightarrow x = ...$	M1
	$x = -\frac{1}{4}, 2$	A1
	$x \leqslant "-\frac{1}{4}", \quad x \geqslant "2"$	M1
	$x \leqslant -\frac{1}{4}$ or $x \geqslant 2$ oe	A1
		(4)
		(4 marks)

Question Number	Scheme	Marks
10	$(k-1)x^6+4x^3+(k-4)=0$	
(a)	$3.5x^6+4x^3+0.5=0 \Rightarrow 7x^6+8x^3+1=0$	
	$\Rightarrow (x^3+1)(7x^3+1)=0$	M1
	$\Rightarrow x^3=-1, \quad x^3=-\frac{1}{7}$	A1
	$\Rightarrow x=-1, \quad x=-\frac{1}{\sqrt[3]{7}}$	A1
		(3)
(b)	Attempts $b^2-4ac=16-4(k-1)(k-4)$	M1
	$=20k-4k^2$	A1
	Solves $b^2-4ac<0 \Rightarrow 4k(5-k)<0 \Rightarrow k<0, \ k>5$	dM1 A1
		(4)
		(7 marks)

Question	Scheme		Marks
4(i)		Correct shape, translated down.	**B1**
		Correct horizontal asymptote labelled	**B1**
		Correct **maximum** and **minimum** points labelled	**B1**
			(3)
(ii)		Correct shape, reflected in *y* axis	**B1**
		Correct horizontal asymptote labelled	**B1**
		Correct **maximum** and **minimum** points labelled.	**B1**
			(3)
			(6 marks)
Notes:			

Question Number	Scheme	Marks
5(a)	$f'(x) = 12x^{-\frac{1}{2}} + \frac{x}{3} - 4$	
	One of $x^{-\frac{1}{2}} \to x^{\frac{1}{2}},\ -4 \to -4x,\ x \to x^2$	M1
	$f(x) = \int 12x^{-\frac{1}{2}} + \frac{x}{3} - 4\,dx = 24x^{\frac{1}{2}} + \frac{x^2}{6} - 4x + c$	A1A1
	$8 = 24(9)^{\frac{1}{2}} + \frac{(9)^2}{6} - 4(9) + c \Rightarrow c = ...$	dM1
	$(f(x) =)\ 24x^{\frac{1}{2}} + \frac{x^2}{6} - 4x - \frac{83}{2}$	A1
		(5)
(b)	$f'(9) = \frac{12}{\sqrt{9}} + \frac{9}{3} - 4 \quad (=3)$	M1
	$3 \to -\frac{1}{3}$	dM1
	$y - 8 = "-\frac{1}{3}"(0 - 9)$	M1
	(0, 11)	A1
		(4)
		(9 marks)

Question	Scheme	Marks
7(a)	$0=10-2x \Rightarrow x=5$ or $y=2, y=10-2x \Rightarrow x=4$	B1
	Examples: $\frac{1}{2}\times 2(5+4-a)=\frac{27}{4}$ or $\frac{1}{2}\times 2\left(5+4-\frac{2}{k}\right)=\frac{27}{4}$ Trapezium or $\frac{1}{2}\times 2a+\frac{1}{2}\times 2(5-a+4-a)=\frac{27}{4}$ or $\frac{1}{2}\times 2\times\frac{2}{k}+\frac{1}{2}\times 2\left(5-\frac{2}{k}+4-\frac{2}{k}\right)=\frac{27}{4}$ Triangle + Trapezium or $\frac{1}{2}\times 2a+2(4-a)+\frac{1}{2}\times 1\times 2=\frac{27}{4}$ or $\frac{1}{2}\times 2\times\frac{2}{k}+2\left(4-\frac{2}{k}\right)+\frac{1}{2}\times 1\times 2=\frac{27}{4}$ Triangle + Rectangle + Triangle or $\frac{1}{2}\times 5\times 2+\frac{1}{2}(4-a)\times 2=\frac{27}{4}$ or $\frac{1}{2}\times 5\times 2+\frac{1}{2}\left(4-\frac{2}{k}\right)\times 2=\frac{27}{4}$ 2 Triangles	M1
	$\Rightarrow k=\frac{8}{9}, a=\frac{9}{4}$	A1 A1ft
		(4)
(b)	Two of $y \geqslant "\frac{8}{9}"x,\ y \leqslant 10-2x,\ x>"\frac{9}{4}"$	M1
	All three of $y \geqslant \frac{8}{9}x,\ y \leqslant 10-2x,\ x>\frac{9}{4}$	A1
		(2)
		(6 marks)