Question Number	Scheme	Marks
10 (a)	$P=\left(-\frac{1}{2},0\right)$	B1 **(1)**
(b)	$f(x)=(x-4)(2x+1)^2 \Rightarrow f(x)=ax^3+bx^2+cx+d$ $=4x^3-12x^2-15x-4$ oe $f'(x)=12x^2-24x-15$	M1 A1 dM1 A1 **(4)**
(c)	Attempts $f'(2.5)=12\times2.5^2-24\times2.5-15=0$ Finds y coordinate for $x=2.5$ $y=-54$	M1A1 A1 **(3)**
(d)	$a=-\frac{1}{2},(+)\,4$	B1, B1 **(2)** **(10 marks)**

Question Number	Scheme	Marks
3(i)	$\sqrt{8} = 2\sqrt{2}$ seen anywhere in the solution (see notes)	B1
	$\left(x+\sqrt{2}\right)^2 + \left(3x-5\sqrt{8}\right)^2$ $= x^2 + 2x\sqrt{2} + 2 + 9x^2 - 30x\sqrt{8} + 25\times 8$	M1
	$= 10x^2 - 58x\sqrt{2} + 202$	A1
		(3)
(ii)	$\sqrt{3}\left(4y - 3\sqrt{3}\right) = 5y + \sqrt{3}$ $\Rightarrow 4\sqrt{3}y - 9 = 5y + \sqrt{3}$ $\Rightarrow 4\sqrt{3}y - 5y = 9 + \sqrt{3}$	M1
	$\Rightarrow y = \ldots$ or $\Rightarrow ky = \ldots$ eg $y = "\dfrac{9+\sqrt{3}}{4\sqrt{3}-5}"$ or $"23"y = "9+\sqrt{3}"$	dM1
	$y = \dfrac{9+\sqrt{3}}{4\sqrt{3}-5} \times \dfrac{4\sqrt{3}+5}{4\sqrt{3}+5} \Rightarrow y = \dfrac{\ldots}{"23"}$	ddM1
	$y = \dfrac{57}{23} + \dfrac{41}{23}\sqrt{3}$ (or $y = 2\dfrac{11}{23} + 1\dfrac{18}{23}\sqrt{3}$)	A1
		(4)
	(ii) Alternative 1:	
	$\sqrt{3}\left(4p + 4q\sqrt{3} - 3\sqrt{3}\right) = 5\left(p + q\sqrt{3}\right) + \sqrt{3}$ $\Rightarrow 4p\sqrt{3} + 12q - 9 = 5p + 5q\sqrt{3} + \sqrt{3}$ $\Rightarrow 4p = 5q + 1,\ 12q - 9 = 5p$	M1 dM1
	$\Rightarrow 4p = 5q + 1,\ 12q - 9 = 5p$ $\Rightarrow p = \ldots,\ q = \ldots$	ddM1
	$y = \dfrac{57}{23} + \dfrac{41}{23}\sqrt{3}$ (or $y = 2\dfrac{11}{23} + 1\dfrac{18}{23}\sqrt{3}$)	A1
		Total 7

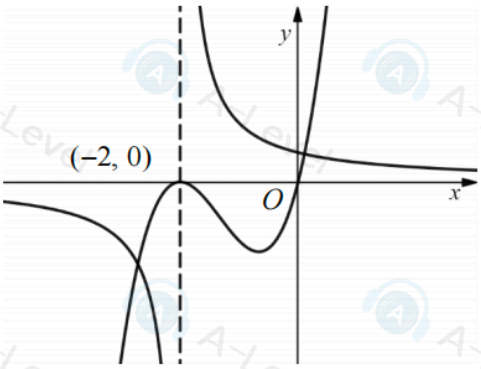
Question Number	Scheme	Marks
1.	$\int \frac{2}{3}x^3 - \frac{1}{2x^3} + 5\,dx = \frac{2}{3}\times\frac{x^4}{4} - \frac{1}{2}\times\frac{x^{-2}}{-2} + 5x + c$	M1 A1
	$= \frac{1}{6}x^4 + \frac{1}{4}x^{-2} + 5x + c$	A1 A1 **(4 marks)**

Question Number	Scheme	Marks
1.	$\int\left(\frac{1}{2}x^3+\frac{3}{\sqrt{x}}-4\right)\mathrm{d}x=\frac{1}{2}\times\frac{x^4}{4}+3\times\frac{x^{\frac{1}{2}}}{\frac{1}{2}}-4x+c$	M1, A1
	$=\frac{1}{8}x^4+6x^{\frac{1}{2}}-4x+c$	A1, A1 **(4 marks)**

Question	Scheme	Marks
10(a)	$f'(4)=6(4)-\frac{7\times14}{4}=-\frac{1}{2}$	B1
	$m_T=-\frac{1}{2}\Rightarrow m_N=\frac{-1}{-\frac{1}{2}}$	M1
	$y-12=2(x-4)$ or $y=mx+c\Rightarrow y=2x+c\Rightarrow 12=2(4)+c\Rightarrow c=\ldots$	M1 (A1 on ePen)
	$y=2x+4$	A1
		(4)
(b)	$\ldots\frac{(2x-1)(3x+2)}{2\sqrt{x}}=\ldots\frac{6x^2+x-2}{2\sqrt{x}}=\ldots 3x^{\frac{3}{2}}+\frac{1}{2}x^{\frac{1}{2}}-x^{-\frac{1}{2}}$	M1
	$f(x)=\frac{6x^2}{2}-\frac{6}{5}x^{\frac{5}{2}}-\frac{1}{3}x^{\frac{3}{2}}+2x^{\frac{1}{2}}(+c)$ or e.g. $f(x)=\frac{6x^2}{2}-\frac{3}{\frac{5}{2}}x^{\frac{5}{2}}-\frac{\frac{1}{2}}{\frac{3}{2}}x^{\frac{3}{2}}+\frac{x^{\frac{1}{2}}}{\frac{1}{2}}(+c)$ or e.g. $f(x)=\frac{6x^2}{2}-\left(\frac{3}{\frac{5}{2}}x^{\frac{5}{2}}+\frac{\frac{1}{2}}{\frac{3}{2}}x^{\frac{3}{2}}-\frac{x^{\frac{1}{2}}}{\frac{1}{2}}\right)(+c)$	M1A1A1
	$12=\frac{6(4)^2}{2}-\frac{6}{5}(4)^{\frac{5}{2}}-\frac{1}{3}(4)^{\frac{3}{2}}+2(4)^{\frac{1}{2}}+c\Rightarrow c=\ldots$	M1
	$(f(x)=)3x^2-\frac{6}{5}x^{\frac{5}{2}}-\frac{1}{3}x^{\frac{3}{2}}+2x^{\frac{1}{2}}+\frac{16}{15}$	A1
		(6)
		Total 10

Question	Scheme	Marks
2(i)(a)	$2^{n+3}=2^n\times2^3=8m$	B1
		(1)
(b)	$16^{3n}=\left(2^4\right)^{3n}$	M1
	$=2^{12n}=\left(2^n\right)^{12}=m^{12}$	A1
		(2)

(ii)	$x\sqrt{3}-3=x+\sqrt{3}\Rightarrow x\sqrt{3}-x=3+\sqrt{3}\Rightarrow x\left(\sqrt{3}-1\right)=3+\sqrt{3}\Rightarrow x=...$	M1
	$=\frac{3+\sqrt{3}}{\sqrt{3}-1}\times\frac{\pm\left(\sqrt{3}+1\right)}{\pm\left(\sqrt{3}+1\right)}$	M1
	$=\frac{\pm\left(4\sqrt{3}+6\right)}{\pm\left(3-1\right)}=3+2\sqrt{3}$	A1
		(3)

Question Number	Scheme	Marks
4a	$x=-2$	B1
		(1)
b	$x^3+4x^2+4x=x(x+2)^2$	M1A1
		(2)
c		B1B1B1
		(3)
d	2 as the graphs intersect (each other) twice (since $(x+2)(x^3+4x^2+4x)=1$ is the same as $x^3+4x^2+4x=\frac{1}{x+2}$)	B1
		(1)
		(7 marks)