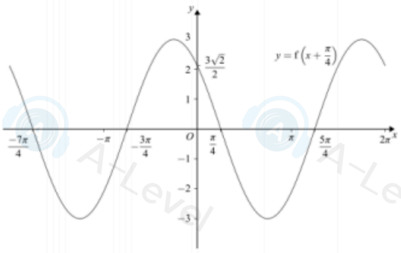
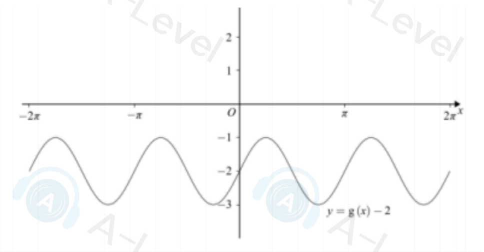
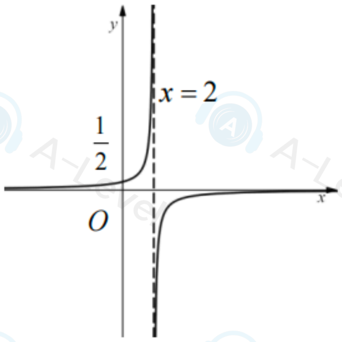
Question Number	Scheme	Marks
4	$\int \frac{3x^{\frac{3}{2}} - 15x^{\frac{1}{2}} + 2x - 10}{4\sqrt{x}} \mathrm{d}x = \int \frac{3}{4}x - \frac{15}{4} + \frac{1}{2}x^{\frac{1}{2}} - \frac{5}{2}x^{-\frac{1}{2}} \mathrm{d}x$	M1A1A1
	$x^n \to x^{n+1}$	dM1
	$\frac{3}{8}x^2 - \frac{15}{4}x + \frac{1}{3}x^{\frac{3}{2}}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

Question Number	Scheme	Marks
8.	Equates $y = k(2x-1)$ and $y = x^2 + 2x + 11 \Rightarrow k(2x-1) = x^2 + 2x + 11$	M1
	$\Rightarrow x^2 + (2-2k)x + 11 + k \quad (=0)$	A1
	Attempts "$b^2 - 4ac$"...0 $\Rightarrow (2-2k)^2 - 4(11+k)...0$ and proceeds to critical values	M1
	Critical values of $(k =)\ 5, -2$	A1
	No roots so $b^2 - 4ac < 0$ so choose inside region	M1
	$-2 < k < 5$	A1
		(6)
		(6 marks)

Question	Scheme		Marks
9(i)(a)	$(y =)\,3\cos(x)$		**M1** **A1**
			(2)
(b)	 	Same shape translated left or right	**B1**
		All x intercepts labelled correctly.	**B1**
		Correct y intercept $\frac{3\sqrt{2}}{2}$	**B1**
			(3)
(ii)(a)	$(y =)\sin(2x)$		**M1** **A1**
			(2)
(b)	 	Same shape translated down below the x-axis.	**B1**
		Correct y intercept -2 labelled.	**B1**
			(2)
			(9 marks)

Question Number	Scheme	Marks
6.(a)	 1/x type shape Fully correct Correct equation of vertical asymptote and y intercept	M1 A1 B1 **(3)**
(b) (i)	Sets $kx-4=\dfrac{1}{2-x}\Rightarrow(kx-4)(2-x)=1$ $kx^2+(-4-2k)x+9=0$ Attempts use $b^2-4ac\ldots0\ \Rightarrow(-4-2k)^2-4k\times9\ldots0$ $\Rightarrow4k^2-20k+16\ldots0\Rightarrow k^2-5k+4\ldots0$ *	M1 A1 dM1 A1*
(ii)	$(k-1)(k-4)\ldots0\Rightarrow k\,,,\ 1,\,k\ldots4$	M1, A1 **(6)** **(9 marks)**

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

Question	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)

Question Number	Scheme	Marks
1. (a)	$y=2x^3-5x^2-\frac{3}{2x}+7 \Rightarrow \frac{dy}{dx}=6x^2-10x+\frac{3}{2x^2}$	M1 A1 A1 **(3)**
(b)	$x=\frac{1}{2} \Rightarrow y=3$	B1
	Substitutes $x=\frac{1}{2}$ into their $\frac{dy}{dx}=6x^2-10x+\frac{3}{2x^2}=\ldots\left(=\frac{5}{2}\right)$	M1
	Uses the perpendicular gradient rule Eg. $\frac{5}{2}\to-\frac{2}{5}$	dM1
	Attempts the equation of the normal at P $y-3=-\frac{2}{5}\left(x-\frac{1}{2}\right)$	M1
	$2x+5y-16=0$ oe	A1 **(5)**
		(8 marks)

Question Number	Scheme	Marks
2(a)(i)		

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
4	$kx^2+6kx+5=0$	
	$b^2-4ac=(6k)^2-4\times k\times5$	M1
	$b^2-4ac=(6k)^2-4\times k\times5...0 \Rightarrow k...$	dM1
	$k<\frac{5}{9}$	A1
	$0<k<\frac{5}{9}$	A1
		(4 marks)