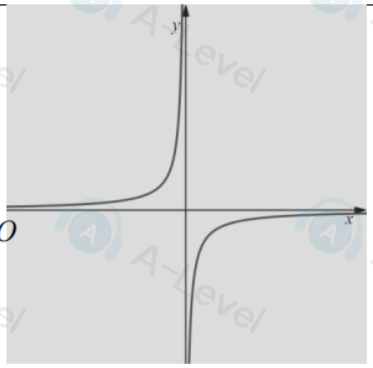
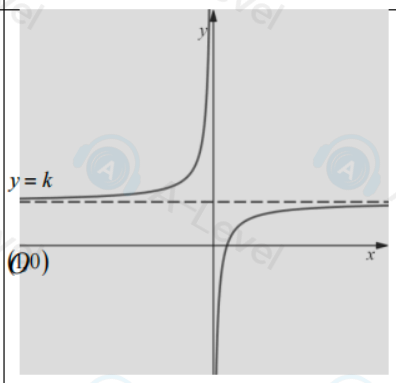
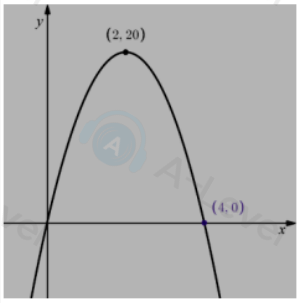
Question	Answer	Marks	Guidance
9(a)	$6\sin 0.9 = \frac{AC}{2}$ or $AC^2 = 6^2 + 6^2 - 2\times 6\times 6\cos 1.8$	M1	OE Correct working in degrees is acceptable throughout.
	$AC = 9.40$	A1	SOI Accept 9.39 – 9.41, may be used but not seen for A1.
	Angle $CAB = ½(\pi - 1.8)$	M1	SOI Expect 0.6708 (or 0.671).
	Arc CD = *their* 9.40 × *their* 0.6708	M1	Expect 6.306 (or 6.31), do not accept 6 for *their AC* or 1.8 for *CAB*.
	[Perimeter = 6 + 3.40 + 6.306 =] 15.7	A1	Accept 15.69 – 15.72.
		5	

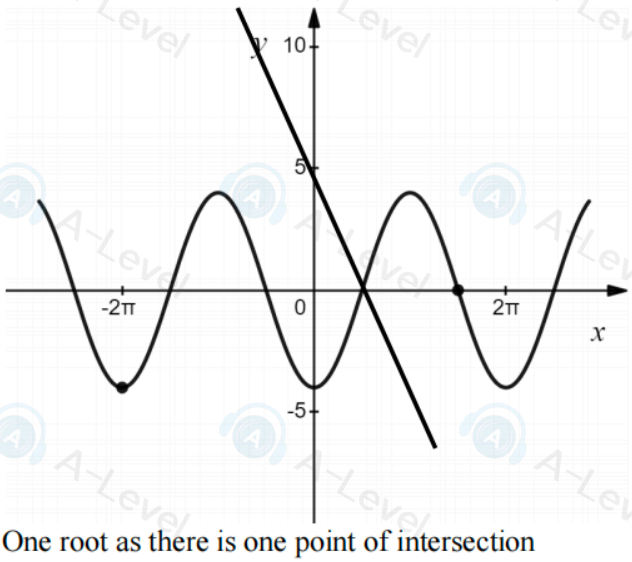
Question	Scheme	Marks
7(a)	$0 = 10 - 2x \Rightarrow x = 5$ or $y = 2, y = 10 - 2x \Rightarrow x = 4$	B1
	Examples: $\frac{1}{2}\times 2\left(5+4-a\right) = \frac{27}{4}$ or $\frac{1}{2}\times 2\left(5+4-\frac{2}{k}\right) = \frac{27}{4}$ Trapezium or $\frac{1}{2}\times 2a + \frac{1}{2}\times 2\left(5-a+4-a\right) = \frac{27}{4}$ 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 $\frac{1}{2}\times 2a + 2\left(4-a\right) + \frac{1}{2}\times 1\times 2 = \frac{27}{4}$ 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 $\frac{1}{2}\times 5\times 2 + \frac{1}{2}\left(4-a\right)\times 2 = \frac{27}{4}$ 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
6.(a)	 Negative reciprocal shape Fully correct	M1 A1 (2)

Question Number	Scheme	Marks
(b)		
	Graph is part (a) translated ↑	B1ft
	Correct asymptote or intercept	B1
	Correct asymptote and intercept	B1
		(3)
(c)	Sets $3x+4=-\frac{k}{x}+k \Rightarrow 3x^2+(4-k)x+k=0$	M1, A1
	Attempts use $b^2-4ac=0$ to find the critical values	M1
	Uses $b^2-4ac<0$ and selects inside region for critical values	dM1
	$10-2\sqrt{21}<k<10+2\sqrt{21}$	A1
		(5)
		(10 marks)

Question Number	Scheme	Marks
1a	$y=5x^3+\frac{3}{x^2}-7x=5x^3+3x^{-2}-7x$	
	$\left(\frac{dy}{dx}=\right)\ 15x^2-6x^{-3}-7$	M1A1A1
		(3)
b	$\left(\frac{d^2y}{dx^2}=\right)\ 30x+18x^{-4}$	M1A1
		(2)
		(5 marks)

Question Number	Scheme	Marks
9 (a)		
	Correct shape and position passing through (0, 0)	B1
	Intersection at (4, 0)	B1
		(2)
(b)	Attempts form of equation. E.g. $y = Ax(x-4)$ or $y = 20 \pm C(x-2)^2$	M1
	Full attempt to find equation. E.g. $20 = A \times 2(2-4) \Rightarrow A = ...$ Or $0 = 20 + C(4-2)^2 \Rightarrow C = ...$	dM1
	$y = -5x(x-4)$, $y = 20 - 5(x-2)^2$ o.e.	A1
		(3)
(c)	Sets $x\left(x^2-4\right) = "-5x(x-4)"$	M1
	$x^3 + 5x^2 - 24x = 0 \Rightarrow x\left(x^2+5x-24\right) = 0$	dM1
	$(x+8)(x-3) = 0 \Rightarrow x$ coordinate of P is -8	ddM1, A1
	$P = \left(-8, -480\right)$	A1
		(5)
		(10 marks)

Question Number	Scheme	Marks
7 (a)(i)	$P = (-2\pi, -4)$	B1, B1
(ii)	$Q = \left(\frac{3\pi}{2}, 0\right)$	B1
		(3)
(b) (i)	$k = 7$	B1
(ii)	$(2\pi, 3)$	M1 A1
		(3)
(c)		M1A1
	One root as there is one point of intersection	
		(2)
		(8 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 Number	Scheme	Marks
10 (a)	$f(x)\leqslant0\Rightarrow\quad x\leqslant-\frac{5}{2},\quad x=3$	M1 A1

Question Number	Scheme	Marks
		(2)
(b)	$f(x)=(2x+5)(x-3)^2=(2x+5)\left(x^2-6x+9\right)$	M1
	$=2x^3-12x^2+18x+5x^2-30x+45$	M1
	$=2x^3-7x^2-12x+45$	A1 **(3)**
(c)	(i) $P(0,45)$	B1ft
	(ii) Gradient $=-12$	B1ft **(2)**
(d)	(i) $g(x)=\left(2(x-2)+5\right)(x-2-3)^2=(2x+1)(x-5)^2$	M1 A1
	(ii) 25	B1 **(3)** **(10 marks)**

Question Number	Scheme	Marks
	$x-2y+25=0$	
5. (a)	$y=\frac{1}{2}x+\frac{25}{2} \Rightarrow y=-2x+...$	M1
	$y=-2x$	A1
		(2)
(b)	Substitutes $y=-2x$ into $x-2y+25=0 \Rightarrow x+4x+25=0$	M1
	$\Rightarrow x=-5,\ y=10$	A1, A1
		(3)
(c)	Shortest distance $=\sqrt{5^2+10^2}=5\sqrt{5}$	M1, A1cso
		(2)
		(7 marks)