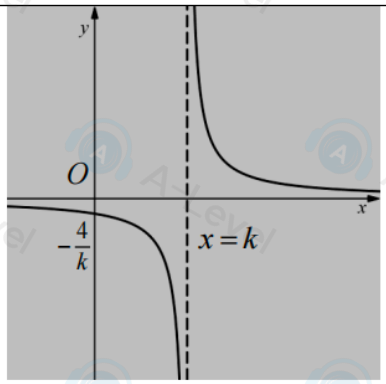
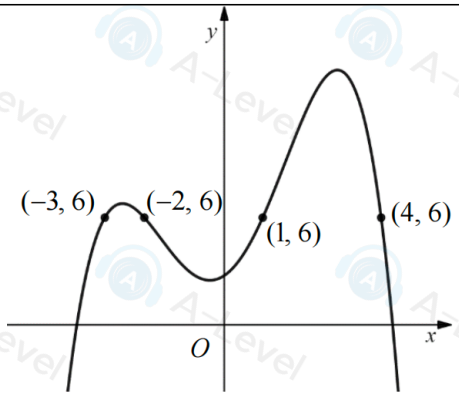
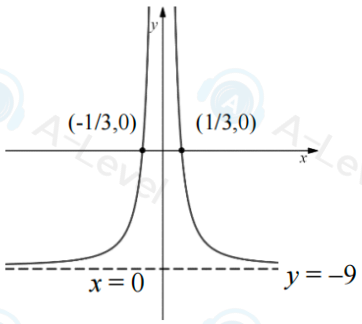
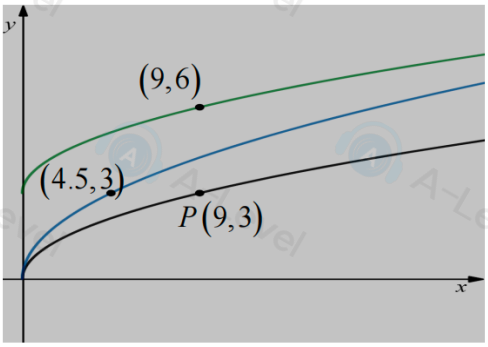
Question Number	Scheme	Marks
7. (a)		
	Shape in quadrant One	M1
	Fully correct shape and position	A1
	C cuts the y-axis at $-\frac{4}{k}$	B1
	C has a vertical asymptote at $x=k$	B1
		(4)
(b)	$\frac{4}{x-k}=9-x \Rightarrow x^2-(9+k)x+9k+4=0$	M1, A1
	Uses $b^2-4ac<0 \Rightarrow (9+k)^2-4\times1\times(9k+4)<0$	dM1
	$k^2-18k+65<0 \Rightarrow (k-13)(k-5)<0 \Rightarrow 5<k<13$	ddM1, A1
		(5)
		(9 marks)

Question Number	Scheme	Marks
7(a)	$-1<x<2$	M1A1
	$x<-4,\ x>3$	B1
		(3)
(b)	$(x=)\ 1.5$	B1
		(1)
(c)(i)		B1B1B1
(ii)	$-3 \le x \le -2$	B1
		(4)
		(8 marks)

Question Number	Scheme	Marks
10(a)		B1B1B1B1
		(4)
(b)	$k < 0$	B1
	$\frac{1}{x^2} - 9 = kx^2 \Rightarrow 1 - 9x^2 = kx^4$	M1
	$1 - 9x^2 = kx^4 \Rightarrow kx^4 + 9x^2 - 1 = 0$ Require $b^2 - 4ac \Rightarrow 81 - 4 \times k \times -1$	M1
	Critical value $(k =) -\frac{81}{4}$	A1
	$-\frac{81}{4} < k < 0$	A1cso
		(5)
		Total 9

Question Number	Scheme	Marks
4 (a)	States or implies that $[f(x) =] kx(x-4)$	M1
	Attempts to find k. E.g. $-4.8 = k \times 2 \times (2-4) \Rightarrow k = ...$	dM1
	$[f(x) =] 1.2x(x-4)$	A1
		(3)
(b)	States or implies that $[g(x) =] \lambda x(x-4)^2$	M1
	Attempts to find λ . E.g. $7.2 = \lambda \times 6 \times (6-4)^2 \Rightarrow \lambda = ...$	dM1
	$[g(x) =] 0.3x(x-4)^2$	A1
		(3)
(c)	Sets their $1.2x(x-4) = 0.3x(x-4)^2$	B1ft
	Valid attempt to solve $1.2\cancel{x}\cancel{(x-4)} = 0.3\cancel{x}(x-4)^{\cancel{2}} \Rightarrow x = 4 + \frac{1.2}{0.3}$	M1
	$x = 8$	A1
	$(8, 38.4)$	A1
		(4) **(10 marks)**

Question Number	Scheme	Marks
9(a)		
	One correct sketch drawn and labelled correctly	M1
	One correct sketch drawn and labelled and with correct point	A1
	Completely correct sketches with both points	A1
		(3)
(b)	Sets $\sqrt{x}+3=\sqrt{2x}$	B1
	$3=\left(\sqrt{2}-1\right)\sqrt{x}$	M1
	$\sqrt{x}=\dfrac{3}{\left(\sqrt{2}-1\right)}\times\dfrac{\left(\sqrt{2}+1\right)}{\left(\sqrt{2}+1\right)}=3\left(\sqrt{2}+1\right)$ *	A1*
		(3)
(c)	$\sqrt{x}=3\left(\sqrt{2}+1\right)\Rightarrow x=9\left(\sqrt{2}+1\right)^2=\ldots$	M1
	$\Rightarrow x=9\left(3+2\sqrt{2}\right),\ y=3\sqrt{2}+6$	A1, B1
		(3)
		(9 marks)

Question Number	Scheme	Marks
9 (a) (i)	Stretch parallel to the x-axis $\times\dfrac{1}{2}$ or stretch parallel to the y-axis $\times\sqrt{2}$	M1, A1
(ii)	Translate by the vector $\begin{pmatrix}0\\12\end{pmatrix}$ (or translate up by 12 (units))	M1, A1
		(4)
(b) (i)	$12-\sqrt{x}=\sqrt{2}\sqrt{x}$	
	$12=\left(\sqrt{2}+1\right)\sqrt{x}$	M1
	$\Rightarrow\sqrt{x}=\dfrac{12}{\sqrt{2}+1}\times\dfrac{\sqrt{2}-1}{\sqrt{2}-1}=12\left(\sqrt{2}-1\right)$ *	dM1, A1 *
Alt (i)	$12-\sqrt{x}=\sqrt{2x}\Rightarrow\left(12-\sqrt{x}\right)^2=2x\Rightarrow x+24\sqrt{x}-144=0$	M1
	$\Rightarrow\left(\sqrt{x}\right)=\dfrac{-24\pm\sqrt{24^2-4\times-144}}{2}=-12\pm\dfrac{12}{2}\sqrt{4+8}=-12\pm12\sqrt{2}$	dM1
	$\sqrt{x}>0\Rightarrow\sqrt{x}=-12+12\sqrt{2}=12\left(\sqrt{2}-1\right)$*	A1
(ii)	$\Rightarrow x=12^2\left(\sqrt{2}-1\right)^2=144\left(2+1-2\sqrt{2}\right)=144\left(3-2\sqrt{2}\right)$	M1, A1
	$y\left\{=12-\sqrt{x}=12-12\left(\sqrt{2}-1\right)\right\}=12\left(2-\sqrt{2}\right)$	B1
	Or common acceptable alt forms: $P\left(432-288\sqrt{2},\ \ 24-12\sqrt{2}\right)$	
		(6) **(10 marks)**

Question Number	Scheme	Marks
1(a)(i)	$(2, 12)$	B1
(ii)	$(2, 15)$	B1
		(2)
(b)	k ,, 3, $k = 5$	M1 A1
		(2)
(c)	$(x =) -5$	B1
		(1)
		(5 marks)