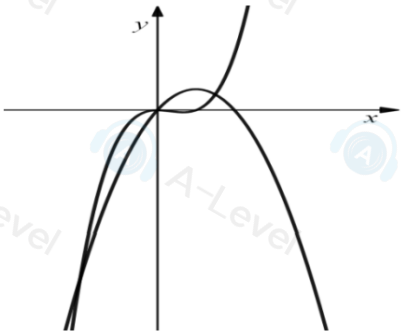
Question Number	Scheme	Marks
7 (a)	States or implies that $f(x)=\lambda x^2(x-4)$	M1
	Attempts to find λ. E.g. $120=\lambda 10^2(10-4)\Rightarrow\lambda=...$	dM1
	$\{f(x)=\}0.2x^2(x-4)$	A1
		(3)
(b)		
	"Upside down" parabola	M1
	Passing through O and +ve x axis > 4	A1
		(2)
(c)	Sets $1.2x(8-x)=$ their $0.2x^2(x-4)$	B1ft
	$1.2x(8-x)=0.2x^2(x-4)\Rightarrow x\left(x^2+2x-48\right)=0$ or $\Rightarrow x^3+2x^2-48x=0$	M1
	$\Rightarrow x=...,...(,0)$	dM1
	For $x=-8,0,6$ OR one of $(-8,-153.6),(6,14.4)$	A1
	All of $(-8,-153.6),(6,14.4),(0,0)$ $\left\{\left(-8,-\frac{768}{5}\right),\left(6,\frac{72}{5}\right),(0,0)\right\}$	A1
		(5)
		(10 marks)

Question Number	Scheme	Marks
3. (a)	$\int f(x)\,dx=\int x^{\frac{3}{2}}+10x^{\frac{1}{2}}+25x^{-\frac{1}{2}}\,dx=\frac{2}{5}x^{\frac{5}{2}}+\frac{20}{3}x^{\frac{3}{2}}+50x^{\frac{1}{2}}+c$	M1 A1 A1 A1
		(4)
(b) (i)	$f'(x)=\frac{3}{2}x^{\frac{1}{2}}+5x^{-\frac{1}{2}}-\frac{25}{2}x^{-\frac{3}{2}}$	M1 A1
	$f'(x)=0\Rightarrow\frac{3}{2}x^{\frac{1}{2}}+5x^{-\frac{1}{2}}-\frac{25}{2}x^{-\frac{3}{2}}=0$ AND $\times x^{\frac{3}{2}}$	dM1
	$\frac{3}{2}x^2+5x^1-\frac{25}{2}=0\Rightarrow 3x^2+10x-25=0$ *	A1*
(ii)	$\left(x=\right)\frac{5}{3}$ only	B1
		(5)
		(9 marks)

Question Number	Scheme	Marks
	$f'(x)=4\sqrt{x^3}+\frac{k}{x^2}=4x^{\frac{3}{2}}+kx^{-2}$	
10 (a)	$f''(x)=6x^{\frac{1}{2}}-2kx^{-3}$	M1, A1
	$f''(2)=6\sqrt{2}-2k\times\frac{1}{8}=0\Rightarrow k=24\sqrt{2}$	dM1, A1
		(4)
(b)	$f'(x)=4x^{\frac{3}{2}}+kx^{-2}\Rightarrow\ f(x)=4\times\frac{2}{5}x^{\frac{5}{2}}-kx^{-1}\left(+c\right)$	M1, A1 ft
	Uses $P\left(2,8\sqrt{2}\right)\Rightarrow 8\sqrt{2}=4\times\frac{2}{5}\times 2^{\frac{5}{2}}-\frac{k}{2}+c\Rightarrow c=p\sqrt{2}$	dM1
	$f(x)=\frac{8}{5}x^{\frac{5}{2}}-\frac{24\sqrt{2}}{x}+\frac{68}{5}\sqrt{2}$	A1
		(4)
		(8 marks)

Question	Scheme	Marks
11(a)	$x=\frac{5\pi}{2}$ **or** $y=12$	B1
	$x=\frac{5\pi}{2}$ **and** $y=12$	B1
		(2)
(b)	$x=\frac{3\pi}{2}$ **or** $y=-21$	B1
	$x=\frac{3\pi}{2}$ **and** $y=-21$	B1
		(2)
(c)(i)	$(A=)-12$	B1
(ii)	$(B=)\frac{5\pi}{4}$	B1
		(2)
		Total 6

Question Number	Scheme	Marks
7 (a)	States or implies that B is $(10, 6)$	B1
	$(AB^2) = (10-0)^2 + ("6"-2)^2 \Rightarrow AB = 2\sqrt{29}$	M1, A1
		(3)
(b)	States or implies that grad $AB = \frac{2}{5}$	B1
	Uses perpendicular gradient rule $\Rightarrow$ grad $l_2 = -\frac{5}{2}$	M1
	$y - "6" = "-\frac{5}{2}"(x-10) \Rightarrow 5x + 2y - 62 = 0$	dM1, A1
		(4)
(c)	C is $\left(\frac{62}{5}, 0\right)$	B1 ft
	$(BC^2) = \left(\frac{62}{5} - 10\right)^2 + ("6"-0)^2 \Rightarrow BC = \frac{6\sqrt{29}}{5} = (6.46)$	
	Area $ABCD = 69.6$	M1, A1
		(3)
		(10 marks)

Question Number	Scheme	Marks
1. (a)	$p^{\frac{1}{2}} = \left(\frac{1}{16}x^4\right)^{\frac{1}{2}} = \frac{1}{4}x^2$	B1
		(1)
(b)	$(pq)^{-1} = \left(\frac{1}{16}x^4 \times \frac{40}{x^3}\right)^{-1} = \left(\frac{5}{2}x\right)^{-1} = \frac{2}{5}x^{-1}$	M1, A1
		(2)
(c)	$pq^2 = \frac{1}{16}x^4 \times \left(\frac{40}{x^3}\right)^2 = \frac{1600}{16} \times \frac{x^4}{x^6} = 100x^{-2}$	M1, A1
		(2)
		(5 marks)

Question Number	Scheme	Marks
9. (a)	(i) 3 (ii) 101 (iii) 2	B1 B1 B1 **(3)**
(b)	$a = \frac{2\pi}{3}$ o.e.	B1 **(1)**
(c)	Attempts x coordinate of Q: $x = "\frac{2\pi}{3}" + \pi = \frac{5\pi}{3}$	M1
	Attempts both y coordinates $P\left(\frac{2\pi}{3}, \frac{\pi}{3}\right)$ $Q\left(\frac{5\pi}{3}, -\frac{2\pi}{3}\right)$	dM1
	Attempts mid-point $PQ = \left(\frac{1}{2}\left(\frac{2\pi}{3} + \frac{5\pi}{3}\right), \frac{1}{2}\left(\frac{\pi}{3} - \frac{2\pi}{3}\right)\right)$	ddM1
	$= \left(\frac{7\pi}{6}, -\frac{\pi}{6}\right)$	A1 **(4)** **(8 marks)**

Question	Scheme	Marks
8(a)	$y = (x-2)(x^2-8x+16) \Rightarrow y = x^3 - 8x^2 + 16x - 2x^2 + 16x - 32 \Rightarrow$ $y = x^3 \pm ... x^2 \pm ... x \pm 32$	M1
	$= x^3 - 10x^2 + 32x - 32$	A1
	$\frac{dy}{dx} = 3x^2 - 20x + 32$*	M1A1*
		(4)
(b)	$x = 6 \Rightarrow y = (6-2)(6-4)^2 = 16$	B1
	$\frac{dy}{dx} = 3(6)^2 - 20(6) + 32 = 20$	B1
	$y - "16" = "20"(x-6)$	M1
	$y = 20x - 104$	A1
		(4)
(c)	$3x^2 - 20x + 32 = "20" \Rightarrow 3x^2 - 20x + 12 = 0$	M1
	$3x^2 - 20x + 12 = 0 \Rightarrow (3x-2)(x-6) = 0 \Rightarrow x = ...$	dM1
	$\alpha = \frac{2}{3}$	A1
		(3)
		(11 marks)

Question	Scheme	Marks
5(a)	$\frac{1}{2}\times 6^2\times 1.3=...$	M1
	$=23.4\,(\text{m}^2)$	A1
		(2)
(b)	$12.2^2=6^2+10.8^2-2\times 6\times 10.8\cos(ABE)$	M1
	$\cos(ABE)=\frac{6^2+10.8^2-12.2^2}{2\times 6\times 10.8}\left(=\frac{19}{648}\right)$ $ABE=1.54$	A1
		(2)
(c)	$\text{Area } ABE=\frac{1}{2}\times 10.8\times 6\sin(ABE)$	M1
	$\text{Area } BCD=\frac{1}{2}\times 6\cos(\pi-1.3-"1.54")\times 6\sin(\pi-1.3-"1.54")$ or e.g. $\text{Area } BCD=\frac{1}{2}\times 6\sin(\pi-1.3-"1.54")\times\sqrt{6^2-(6\sin(\pi-1.3-"1.54"))^2}$	M1
	$\text{Total area}=60.9\text{m}^2$	A1
		(3)
		Total 7