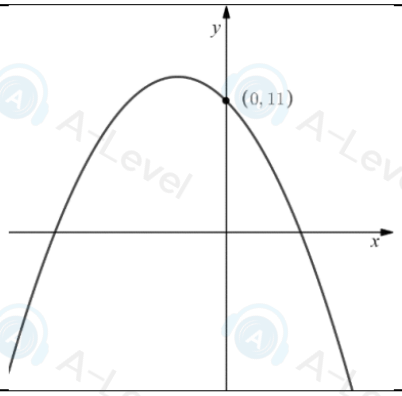
Question Number	Scheme	Marks
10. (a)	Correct equations $\frac{1}{2}r^2\theta = 6, \quad 2r + r\theta = 10$	B1 B1
	Eliminates $r = \frac{10}{2+\theta} \Rightarrow \frac{1}{2}\left(\frac{10}{2+\theta}\right)^2 \theta = 6$	M1
	$\Rightarrow 50\theta = 6\left(4 + 4\theta + \theta^2\right) \Rightarrow 3\theta^2 - 13\theta + 12 = 0$ *	A1*
		(4)
(b)	$(3\theta - 4)(\theta - 3) = 0 \Rightarrow \theta = \frac{4}{3}, 3$	B1
	$\theta = \frac{4}{3}, r = 3 \qquad \theta = 3, r = 2$	M1 A1
		(3)
		(7 marks)

Question Number	Scheme	Marks
6 (a)	$\frac{\sin CAO}{17} = \frac{\sin 0.6}{15} \Rightarrow CAO = 0.6944...$	M1
	Angle $COA = \pi - 0.6 - "0.6944" = 1.847$ *	dM1, A1*
		(3)
(b)	Attempts $\frac{1}{2}r^2\theta = \frac{1}{2} \times 15^2 \times \theta$ where $\theta = \left(2\pi - 1.847\right)$ or just 1.847 OR attempts $\frac{1}{2}ab\sin C = \frac{1}{2} \times 15 \times 17 \sin\left(1.847\right)$	M1
	Attempts $\frac{1}{2}r^2\theta = \frac{1}{2} \times 15^2 \times \left(2\pi - 1.847\right)\left(\approx 499\right)$ AND $\frac{1}{2}ab\sin C = \frac{1}{2} \times 15 \times 17 \sin\left(1.847\right)\left(\approx 122.7\right)$ AND adds	dM1
	(awrt) 622 m^2	A1
		(3)
(c)	$r\theta = 15 \times \theta$ where $\theta = \left(2\pi - 1.847\right)$ or just 1.847 OR $\left(AC^2 =\right) 15^2 + 17^2 - 2 \times 15 \times 17 \cos(1.847) (\approx 653)$	M1
	Attempts $r\theta = 15 \times \left(2\pi - 1.847\right)\left(= 66.54\right)$ AND $\{AC =\} \sqrt{15^2 + 17^2 - 2 \times 15 \times 17 \cos(1.847)}$	dM1
	92.1 + 2 = (awrt) 94.1 m	A1
		(3)
		(9 marks)

Question Number	Scheme	Marks
11 (a)	Gradient of normal $= \frac{1}{4}$	B1
	Equation of normal $(y+50) = "\frac{1}{4}"(x-4) \Rightarrow y = \frac{1}{4}x - 51$	M1 A1
		(3)
(b)	$(f''(x) =)\ \frac{6}{\sqrt{x^3}} + x = 6x^{-\frac{3}{2}} + x \Rightarrow f'(x) = -12x^{-\frac{1}{2}} + \frac{1}{2}x^2 + k$	M1 A1
	Substitutes $x = 4,\ f'(x) = -4 \Rightarrow k = -6$	dM1 A1
	$(f'(x) =)\ -12x^{-\frac{1}{2}} + \frac{1}{2}x^2 - 6 \Rightarrow (f(x) =)\ -24x^{\frac{1}{2}} + \frac{1}{6}x^3 - 6x + d$	dM1 A1ft
	Substitutes $x = 4,\ f(x) = -50 \Rightarrow d = \frac{34}{3}$	dddM1
	$(f(x) =) -24x^{\frac{1}{2}} + \frac{1}{6}x^3 - 6x + \frac{34}{3}$	A1
		(8)
		(11 marks)

Question Number	Scheme	Marks
9.	$\frac{4x^2+9}{2\sqrt{x}} = \frac{4x^2}{2\sqrt{x}} + \frac{9}{2\sqrt{x}} = 2x^{\frac{3}{2}} + \frac{9}{2}x^{-\frac{1}{2}}$	M1 A1
	$\left(\frac{dy}{dx} =\right)\ 3x^{\frac{1}{2}} - \frac{9}{4}x^{-\frac{3}{2}}$	M1 A1
	$\left(\frac{dy}{dx} =\right)\ 3x^{\frac{1}{2}} - \frac{9}{4}x^{-\frac{3}{2}} = 0 \Rightarrow x^2 = \frac{3}{4} \Rightarrow x = \frac{\sqrt{3}}{2}$	M1 A1
		(6)
		(6 marks)

Question Number	Scheme	Marks
5(a)	$9^x = p^2,\ \ 3^{x+2} = 9p$ or $3^{x-1} = \frac{p}{3}$	B1
	$3\times 9^x + 3^{x+2} = 1 + 3^{x-1} \Rightarrow 3p^2 + 3^2 \times p = 1 + \frac{p}{3^1}$	M1
	$9p^2 + 26p - 3 = 0$ via $3p^2 + 9p = 1 + \frac{p}{3}$*	A1*
		(3)
(b)	$9p^2 + 26p - 3 = 0 \Rightarrow (9p-1)(p+3) = 0$	M1
	$3^x = \frac{1}{9}$	A1 M1 in EPEN
	$x = -2$	A1
		(3)
		(6 marks)

Question Number	Scheme	Marks
2(a)	$f(x) = 11 - 4x - 2x^2$ $\Rightarrow \ldots \underline{-2}(2x + x^2) \ldots$ or $\Rightarrow \ldots \underline{-2}(2x + x^2 \ldots)$	B1
	$\ldots(2x + x^2) \Rightarrow \ldots\left((x+1)^2 \pm \ldots\right)$	M1
	$(f(x) =)\ 13 - 2(x+1)^2$	A1
		(3)
(b)		M1 A1
		(2)
(c)	$x = -1$	B1ft
		(1)
		Total 6
Alt(a)	$a + b(x^2 + 2cx + c^2) = 11 - 4x - 2x^2$ $b = -2$	B1
	$2bc = -4 \Rightarrow c = \ldots (= 1)$	M1
	$a + bc^2 = -4 \Rightarrow a = \ldots (= 13)$ $(f(x) =)\ 13 - 2(x+1)^2$	A1

Question	Scheme	Marks
1	$a = 162$ $b = 5$ $c = 12$	B1 B1 B1
		(3 marks)

Question Number	Scheme	Marks
7.(a)	Attempts to use $\frac{1}{2}r^2\theta$ with $r=6$ and any allowable angle θ	M1
	Full method to find area $\frac{1}{2}\times6^2\times(2\pi-0.7)$ or $\pi\times6^2-\frac{1}{2}\times6^2\times0.7$	M1
	$=100.5\,\text{cm}^2$ (awrt)	A1
		(3)
(b)	Attempts $\frac{\sin\angle ADO}{6}=\frac{\sin 0.7}{5}\Rightarrow\sin\angle ADO=0.77...$	M1 A1
	$\angle ADO=2.258$ (awrt)	A1
		(3)
(c)	Attempts arc length $ABC=6\times(2\pi-0.7)$ 33.50	M1
	Attempts length OD $\frac{\sin(\pi-0.7-"2.258")}{OD}=\frac{\sin 0.7}{5}\Rightarrow OD=...$ 1.42	M1
	Full method to find perimeter $="33.50"+5+6-"1.42"$	ddM1
	$=43.1$ cm	A1
		(4)
		(10 marks)

Question Number	Scheme	Marks
2. (a)	$5(x+3)>4(2x-5)\Rightarrow5x+15>8x-20\Rightarrow ax>b$ or $px<q$	M1
	$\Rightarrow x<\frac{35}{3}$	A1
		(2)
(b) (i)	$x^2-6x+1=(x-3)^2\pm...=(x-3)^2-8$	M1, A1
(ii)	$(x-3)^2-8=0\Rightarrow x=3+\sqrt{8}$ or $3-\sqrt{8}$	M1
	$x^2-6x+1\geqslant0\Rightarrow x\leqslant3-\sqrt{8}, x\geqslant3+\sqrt{8}$	A1
		(4)
(c)	$x\leqslant3-\sqrt{8},\ 3+\sqrt{8}\leqslant x<\frac{35}{3}$	B1
		(1)
		(7 marks)

Question Number	Scheme	Marks
3.(a)	Attempts to make y the subject	M1
	States $-\frac{3}{5}$ or exact equivalent	A1
		(2)
(b)	Uses perpendicular gradients rule $\Rightarrow$ gradient $l_2 = \frac{5}{3}$	M1
	Forms equation of l_2 using (6,-2) $\quad y+2="\frac{5}{3}"(x-6)$	M1
	$y=\frac{5}{3}x-12$	A1
		(3)
		(5 marks)
Alt1(a)	Eg Coordinates of two points on the line $(0,1.4)$ and $(1,0.8)$	
	Gradient $=\frac{0.8-1.4}{1-0}$	M1
	Gradient $=-0.6$	A1

Question Number	Scheme	Marks
6(a)	$\frac{2(4)^2+a\times4+b}{4\sqrt{4}}=7\Rightarrow32+4a+b=56\Rightarrow4a+b=24$ *	M1A1*
		(2)
(b)	$4a+b=24,\ a+b=-9\Rightarrow a=11,\ b=-20$	M1A1
	$\frac{x^{\frac{3}{2}}}{2}+\frac{11x^{\frac{1}{2}}}{4}-5x^{-\frac{1}{2}}$	M1
	$\int\frac{x^{\frac{3}{2}}}{2}+\frac{11x^{\frac{1}{2}}}{4}-5x^{-\frac{1}{2}}\,dx\Rightarrow$ Two of $\frac{x^{\frac{5}{2}}}{5},\ \frac{"11"x^{\frac{3}{2}}}{6},\ \frac{"-20"}{2}x^{\frac{1}{2}}$	dM1A1ft
	$\frac{(4)^{\frac{5}{2}}}{5}+\frac{11(4)^{\frac{3}{2}}}{6}-10(4)^{\frac{1}{2}}+c=-5\Rightarrow c=...$	M1
	$(f(x)=)\ \frac{1}{5}x^{\frac{5}{2}}+\frac{11}{6}x^{\frac{3}{2}}-10x^{\frac{1}{2}}-\frac{91}{15}$	A1
		(7)
(c)	$(7,-5)$	B1
		(1)
		(10 marks)

Question Number	Scheme	Marks
1.	$\int 12x^3+\frac{1}{6\sqrt{x}}-\frac{3}{2x^4}\,dx=12\times\frac{x^4}{4}+\frac{1}{6}\times 2x^{\frac{1}{2}}-\frac{3}{2}\times\frac{x^{-3}}{-3}$	M1
	$=3x^4+\frac{1}{3}x^{\frac{1}{2}}+\frac{1}{2}x^{-3}+c$	A1A1A1A1
		(5)
		(5 marks)

Question	Scheme	Marks
4(a)	$x^2+kx-9=-3x^2-5x+k\Rightarrow 4x^2+kx+5x-9-k(=0)$	M1
	$b^2-4ac=0\Rightarrow(k+5)^2-4\times4(-9-k)=0$	M1
	$k^2+26k+169=0*$	A1*
		(3)
(b)	$k^2+26k+169=0\Rightarrow k=-13$	B1
	$k=-13\Rightarrow 4x^2-8x+4=0\Rightarrow x=...$	M1
	$(1,-21)$	A1
		(3)
		Total 6