Question Number	Scheme	Marks
3(a)(i)	$a_1 = \frac{1}{4}$	B1
(ii)	$a_2 = \frac{1}{4}$	B1
(iii)	$a_3 = 1$	B1
		(3)
(b)	$\frac{50}{2}[2+49]$ $(=1275)$ oe	M1A1
	$\sum_{n=1}^{50} \cos^2\left(\frac{n\pi}{3}\right) = 34\times\frac{1}{4}+16\times1$	M1
	$1275+\frac{49}{2}=\frac{2599}{2}$	A1
		(4)
		(7 marks)

Question Number	Scheme	Marks
8(i)	Provides a counter example E.g. $\sqrt{2}\times\sqrt{8}=4$	B1 **(1)**
(ii)	Knows that odd numbers are of the form $2k+1, \quad (k \in \mathbb{N})$	B1
	Attempts $(2k+1)^3+3(2k+1)+2=....$	M1
	$=8k^3+12k^2+12k+6$	A1
	$=4\times\left(2k^3+3k^2+3k+1\right)+2$	A1*
	Which is even but not a multiple of 4. Hence proven	**(4)**
		(5 marks)

Question Number	Scheme	Marks
6(a)	Sets $f\left(-\frac{3}{2}\right)=0 \Rightarrow \left(9p+4q=102\right)$	M1
	Sets $f(-2)=-5 \Rightarrow \left(4p+q=43\right)$	M1
	Solves to get values for p and q	dM1
	(i) $p=10$ * (ii) $q=3$ following two correct equations	A1*, A1
		(5)
(b)	$f'(x)=12x^2+20x+8$	B1
	Solves $f'(x)=0 \Rightarrow 4(3x+2)(x+1)=0 \Rightarrow x=-\frac{2}{3},-1$	M1, A1
	$-1<x<-\frac{2}{3}$	A1
		(4)
		Total 9

Question Number	Scheme	Marks
10 (a)	$\left(\frac{dy}{dx}=\right) x-2187x^{-\frac{5}{2}}$	M1, A1
	Sets $x-2187x^{-\frac{5}{2}}=0 \Rightarrow x^{\frac{7}{2}}=2187$ $\left(\text{or e.g. } x=\left(\sqrt[7]{2187}\right)^2\right) \Rightarrow x=9$ *	dM1A1*
		(4)
(b)	e.g. $\int\left\{\frac{1}{2}x^2+1458x^{-\frac{3}{2}}-74\right\}dx=\frac{1}{6}x^3-2916x^{-\frac{1}{2}}-74x$ or $\int\left\{\frac{1}{2}x^2+1458x^{-\frac{3}{2}}-"94.5"\right\}dx=\frac{1}{6}x^3-2916x^{-\frac{1}{2}}-94.5x$	M1A1ft
	y value at P is 20.5	B1
	e.g. Area $R=\left[\frac{1}{6}x^3-2916x^{-\frac{1}{2}}-74x\right]_4^9-(9-4)\times"20.5"$ $=\left(\frac{1}{6}\times9^3-2916\times9^{-\frac{1}{2}}-74\times9\right)-\left(\frac{1}{6}\times4^3-2916\times4^{-\frac{1}{2}}-74\times4\right)-(9-4)\times"20.5"$	dM1
	$\left(-1516\frac{1}{2}+1743\frac{1}{3}-102\frac{1}{2}\right)=124\frac{1}{3}$	A1
		(5)
		Total 9

Question Number	Scheme	Marks
5(i)	$4\tan\theta+5\sin\theta=0$	
	States or uses $\tan\theta=\frac{\sin\theta}{\cos\theta} \rightarrow 4\frac{\sin\theta}{\cos\theta}+5\sin\theta=0$	M1
	$\sin\theta(4+5\cos\theta)=0$	
	$\cos\theta=-\frac{4}{5}$	dM1
	$\cos\theta=-\frac{4}{5} \Rightarrow \theta=$ awrt 143° or awrt 217°	A1
	$\cos\theta=-\frac{4}{5} \Rightarrow \theta=$ awrt 143.1° and awrt 216.9°	A1
	$\sin\theta=0 \Rightarrow \theta=180°, 360°$	B1
		(5)
(ii)	$\frac{\sin x}{\cos x}+\frac{\cos x}{\sin x}=\frac{5}{\cos x} \overset{\times\sin x\cos x}{\Rightarrow} \sin^2 x+\cos^2 x=5\sin x$	
	$5\sin x=1$	M1, A1
	$x=$ awrt 0.201, 2.94	dM1, A1
		(4)
		(9 marks)

Question	Answer	Marks	Guidance
5	Use product rule to differentiate $4e^{2x}y$	M1	
	Obtain correct $8e^{2x}y+4e^{2x}\frac{dy}{dx}$	A1	
	Obtain $\left[8e^{2x}y+4e^{2x}\frac{dy}{dx}\right]+2y\frac{dy}{dx}=0$	B1	
	Substitute $x=0$ and $y=-7$ to find value of $\frac{dy}{dx}$	M1	dependent at least one term involving $\frac{dy}{dx}$ from implicit differentiation.
	Obtain $-\frac{28}{5}$	A1	OE
		5	

Question	Answer	Marks	Guidance
1	State or imply that $\cos\theta=\frac{1}{3}\sqrt{5}$	B1	or exact equivalent.
	Substitute appropriate values into $\sin\theta\cos60°+\cos\theta\sin60°$	M1	
	Obtain $\frac{1}{3}+\frac{1}{6}\sqrt{15}$	A1	or exact equivalent.
		3	

Question Number	Scheme	Marks
1(a)	$h=1.25$	B1
	$A\approx\frac{1}{2}\times1.25\{3.479+5.182+2(6.101+7.448+6.823)\}$	M1
	$=30.9$	A1
		(3)
(b)	$\int_{0.5}^{5.5}(f(x)+4x)\,dx=30.9+\left[2x^2\right]_{0.5}^{5.5}=30.9+2\times5.5^2-2\times0.5^2$ **or** $\int_{0.5}^{5.5}(f(x)+4x)\,dx=\int_{0.5}^{5.5}f(x)\,dx+\frac{1}{2}(4\times0.5+4\times5.5)\times5=...$	M1
	$=30.9+60=90.9$	A1ft
		(2)
		Total 5

Question Number	Scheme	Marks
2.(a)	E.g. $64\times\left(-\frac{1}{2}\right)^3=-8$ ✓ *	M1, A1* **(2)**
(b)	Finds the value of a. E.g. $64\div\left(-\frac{1}{2}\right)^2=256$	M1, A1
	Uses $S_\infty=\frac{a}{1-r}=\frac{256}{1-\left(-\frac{1}{2}\right)}=\frac{512}{3}$	M1, A1 **(4)** **(6 marks)**

Question Number	Scheme	Marks
8. (a)	$-5<x<\frac{2}{3}$	M1, A1 **(2)**
(b)	$(2x-7)$	B1 **(1)**
(c)	$f'(x)=2(3x-2)(x+5)=6x^2+26x-20$	
	$f(x)=2x^3+13x^2-20x+c$	M1, A1
	$x=\frac{7}{2},\quad y/f(x)=0\Rightarrow c=(-175)$	dM1, A1
	$f(x)=2x^3+13x^2-20x-175=(2x-7)(x^2+10x+25)$	ddM1
	$=(2x-7)(x+5)^2$	A1 **(6)** **(9 marks)**

Question Number	Scheme	Marks
1(a)	$f(-1)=(-1)^4+a(-1)^3-3(-1)^2+b(-1)+5=4$	M1
	$1-a-3-b+5=4\Rightarrow a+b=-1$ *	A1*
		(2)
(b)	$f(2)=(2)^4+a(2)^3-3(2)^2+b(2)+5=-23$	M1
	$\Rightarrow 8a+2b=-32$ oe (eg $4a+b=-16$)	A1
	$b=-1-a\Rightarrow 4a-1-a=-16\Rightarrow a=...$	dM1
	$a=-5, b=4$	A1
		(4)
		(6 marks)

Question Number	Scheme	Marks
3 (a)	States $h = 3$, or use of $\frac{1}{2}\times 3$	B1
	$\left\{8.485 + 1.100 + 2\left(2.502 + 1.524\right)\right\}$	M1
	$= \frac{1}{2}\times 3 \times\left\{17.637\right\} =$ awrt 26.46	A1
		(3)
(b)	Either adds 9 or halves their answer from part (a)	M1
	Full attempt using a correct method Estimate = 9 + 13.23 = awrt 22.2	dM1A1ft
		(3)
		(6 marks)

Question Number	Scheme	Marks
4 (a)	$(3+2x)^6$	
	First term 3^6 or 729	B1
	Term in x, x^2 or x^3: Award for one of ${}^6C_5\left(3\right)^5\left(2x\right)^1$, ${}^6C_4\left(3\right)^4\left(2x\right)^2$ or ${}^6C_3\left(3\right)^3\left(2x\right)^3$	M1
	Two of $\ldots+2916x+4860x^2+4320x^3+\ldots$	A1
	$(3+2x)^6 = 729+2916x+4860x^2+4320x^3+\ldots$	A1
		(4)
(b)	Attempts one correct term $2x^2\times$"729" **or** $\pm\frac{1}{6x}\times$"4320"x^3	M1
	Attempts to combine the correct two terms $2x^2\times$"729"$\pm\frac{1}{6x}\times$"4320"$x^3 = \ldots x^2$	dM1
	738 but condone $738x^2$	A1
		(3)
		Total 7