Question Number	Scheme	Marks
1 (a)	$\dfrac{5x+10}{(1-x)(2+3x)} \equiv \dfrac{A}{1-x}+\dfrac{B}{2+3x} \Rightarrow$ Value for A or B	**M1**
	One correct value, either $A=3$ or $B=4$	**A1**
	Correct PF form $\dfrac{3}{1-x}+\dfrac{4}{2+3x}$	**A1**
		(3)
(b)(i)	$\dfrac{A}{1-x}=A(1-x)^{-1}=A\left(1+x+x^2+\ldots\right)$	**B1**
	$\left\{\dfrac{B}{2}\right\}\left(1+\dfrac{3x}{2}\right)^{-1}=\left\{\dfrac{B}{2}\right\}\left(1+(-1)\dfrac{3x}{2}+\dfrac{(-1)(-2)}{2}\left(\dfrac{3x}{2}\right)^2+\ldots\right);=\dfrac{B}{2}\left(1-\dfrac{3x}{2}+\dfrac{9x^2}{4}+\ldots\right)$	**M1; A1**
	$\mathrm{f}(x)=\ 3\times\left(1+x+x^2+\ldots\right)+\ \dfrac{4}{2}\left(1-\dfrac{3x}{2}+\dfrac{9x^2}{4}+\ldots\right)$	**M1**
	$=5+\dfrac{15}{2}x^2+\ldots$	**A1**
		(5)
(b)(ii)	$\lvert x\rvert<\dfrac{2}{3}$	**B1**
		(1)
		(9 marks)

Question Number	Scheme	Marks
9(a)(i)	$\frac{dy}{dx}=\frac{dy/dt}{dx/dt}=\frac{3\sin^2 t\cos t}{-4\sin 2t}$	M1A1
	$\frac{3\sin^2 t\cos t}{-4\sin 2t}=\frac{3\sin^2 t\cos t}{-8\sin t\cos t}=-\frac{3}{8}\sin t$ or e.g. $\frac{3\sin^2 t\cos t}{-4\sin 2t}=\frac{\frac{3}{2}\sin 2t\sin t}{-4\sin 2t}=-\frac{3}{8}\sin t$	A1
(ii)	$t=\frac{\pi}{6}\ \Rightarrow\ x=1,\ \ y=\frac{1}{8}$	B1
	$m=-\frac{3}{8}\sin\left(\frac{\pi}{6}\right)=-\frac{3}{16}\ \Rightarrow y-\frac{1}{8}=-\frac{3}{16}(x-1)$	M1
	$3x+16y-5=0$ *	A1*
		(6)
(b)	$3(2\cos 2t)+16(\sin^3 t)-5=0$	M1
	$6(1-2\sin^2 t)+16\sin^3 t-5=0$	dM1
	$16\sin^3 t-12\sin^2 t+1=0$	A1
	$(2\sin t-1)^2(4\sin t+1)=0\Rightarrow\sin t=-\frac{1}{4}$	ddM1
	$\sin t=-\frac{1}{4}\Rightarrow x=2\cos 2t=..$ **and** $y=\sin^3 t=...$	dddM1
	$Q\left(\frac{7}{4},-\frac{1}{64}\right)$	A1
		(6)
		(12 marks)

Question Number	Scheme	Marks
1 (a)	$(1+kx)^{\frac{1}{2}}=1+\left(\frac{1}{2}\right)\times(kx)+\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)}{2!}\times(kx)^2+\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{3!}\times(kx)^3\ldots$	
(i)	$\frac{1}{2}k=\frac{1}{8}\Rightarrow k=\frac{1}{4}$	M1A1
(ii)	$A=\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)}{2!}\times "k"^2=-\frac{1}{128}$ $\quad B=\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{3!}\times "k"^3=\frac{1}{1024}$	M1 A1 A1
		(5)
(b)	Substitutes $x=0.6\Rightarrow\sqrt{1.15}=1+\frac{1}{8}\times0.6-"\frac{1}{128}"\times0.6^2+"\frac{1}{1024}"\times0.6^3=1.072398$	M1 A1
		(2)
		(7 marks)
1(b) alt	$(1+kx)^{\frac{1}{2}}=1+\left(\frac{1}{2}\right)\times(kx)-\left(\frac{1}{8}\right)\times(kx)^2+\left(\frac{1}{16}\right)\times(kx)^3$ Substitutes $"kx"=0.15$ $\Rightarrow\sqrt{1.15}=1+\frac{1}{2}\times0.15-\frac{1}{8}\times0.15^2+\frac{1}{16}\times0.15^3=1.072398$	M1A1
		(2)

Question Number	Scheme	Marks
4(a)	$\frac{1}{\sqrt{4-x^2}}=\left(4-x^2\right)^{-\frac{1}{2}}=4^{-\frac{1}{2}}\left(1-\ldots\right)$	B1
	$\left(1-\frac{1}{4}x^2\right)^{-\frac{1}{2}}=1+\left(-\frac{1}{2}\right)\left(-\frac{1}{4}x^2\right)+\frac{\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{2}\left(-\frac{1}{4}x^2\right)^2+\frac{\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)\times\left(-\frac{5}{2}\right)}{3!}\left(-\frac{1}{4}x^2\right)^3$	M1, A1
	$\frac{1}{\sqrt{4-x^2}}=\frac{1}{2}+\frac{1}{16}x^2+\frac{3}{256}x^4+\frac{5}{2048}x^6$	A1, A1
		(5)
(b)	$\lvert x\rvert<2$	B1
		(1)
(c)	Substitutes an appropriate value of x in both sides with LHS in terms of $\sqrt{3}$	M1
	E.g. with $x=1$ $\sqrt{3}=\frac{2048}{1181}$ or $\frac{3543}{2048}$	A1
		(2)
		(8 marks)

Question Number	Scheme	Marks
1(a)	$(8-3x)^{-\frac{1}{3}}=\frac{1}{2}\left(1-\frac{3}{8}x\right)^{-\frac{1}{3}}$	B1
	$\left(1-\frac{3}{8}x\right)^{-\frac{1}{3}}=1+\left(-\frac{1}{3}\right)\left(-\frac{3}{8}x\right)+\frac{-\frac{1}{3}\left(-\frac{1}{3}-1\right)}{2!}\left(-\frac{3}{8}x\right)^2+\frac{-\frac{1}{3}\left(-\frac{1}{3}-1\right)\left(-\frac{1}{3}-2\right)}{3!}\left(-\frac{3}{8}x\right)^3+\ldots$	M1
	$(8-3x)^{-\frac{1}{3}}=\frac{1}{2}+\frac{1}{16}x+\frac{1}{64}x^2+\frac{7}{1536}x^3+\ldots$	A1 A1
		(4)
(b)	$\frac{1}{2}+\frac{1}{16}\left(\frac{2}{3}\right)+\frac{1}{64}\left(\frac{2}{3}\right)^2+\frac{7}{1536}\left(\frac{2}{3}\right)^3+\ldots=\frac{2851}{5184}\Rightarrow\sqrt[3]{6}=\left(\frac{2851}{5184}\right)^{-1}=\ldots$	M1
	$=\frac{5184}{2851}$ or $1\frac{2333}{2851}$	A1
		(2)
		Total 6

Question Number	Scheme	Marks
4 (a)	Attempt at chain rule $y^2\rightarrow\ldots y\frac{dy}{dx}$	M1
	Attempt at product rule $2xy\rightarrow\alpha x\frac{dy}{dx}+\beta y$	M1
	Correct differentiation $8x+2y\frac{dy}{dx}-2y-2x\frac{dy}{dx}=24$ oe	A1
	Collects terms in $(2y-2x)\frac{dy}{dx}=24-8x+2y$	M1
	$\left(\frac{dy}{dx}=\right)\frac{12-4x+y}{y-x}$ oe	A1
		(5)
(b)	Sets $\frac{12-4x+y}{y-x}=2\Rightarrow y=12-2x$ or $x=6-\frac{1}{2}y$	M1
	Substitute $y=12-2x$ or $x=6-\frac{1}{2}y$ into $4x^2+y^2-2xy=24x$	dM1
	$x^2-8x+12=0$ oe or $y^2-8y=0$	A1
	Solves $x=6, y=0$ or $x=2, y=8$	ddM1
	Chooses $a(x)=2, b(y)=8$ or states $(2,8)$ only	A1
		(5)
		(10 marks)