Question	Answer	Marks	Partial marks
5	[When $x = 3$] $y = \frac{2}{3}$ soi	**B1**	
	Correct derivative: $\frac{x \times \frac{1}{2}(x+1)^{-\frac{1}{2}} - \sqrt{x+1}}{x^2}$ or $-x^{-2}(x+1)^{\frac{1}{2}} + x^{-1} \times \frac{1}{2}(x+1)^{-\frac{1}{2}}$	**M2**	**M1** for an attempt to differentiate using the quotient rule oe
	Gradient of tangent: $\frac{3 \times \frac{1}{2}(4)^{-\frac{1}{2}} - \sqrt{4}}{3^2}$	**M1**	**dep** on attempt at a derivative which includes $(x+1)^{-\frac{1}{2}}$
	$-\frac{5}{36}$ isw	**A1**	**dep** on having a **correct derivative**
	$y = -\frac{5}{36}x + \frac{13}{12}$ oe or $y - \frac{2}{3} = \left(-\frac{5}{36}\right)(x - 3)$ oe soi	**A1**	**FT** *their* non-zero $\frac{2}{3}$ and *their* non- zero $-\frac{5}{36}$
	$A(15, -1)$	**B2**	**B2 dep** on all previous marks awarded **B1 dep** for $x = 15$ or $y = -1$
6(a)	$\frac{2}{3}(3x+2)^{\frac{1}{2}}(+c)$ oe	**2**	**B1** for $k(3x+2)^{\frac{1}{2}}$ oe, soi where k is a constant and $k \neq 0$
6(b)	$-\frac{e^{1-2a}}{2} + \frac{1}{2}$ oe, isw	**3**	**B2** for $-\frac{1}{2}e^{(1-2x)}$ oe or **B1** for $ke^{(1-2x)}$ or $ke^{(1-2a)}$ where k is a constant, $k \neq 0$
7(a)	$x = \sqrt[3]{\frac{28}{56}}$ oe, nfww, isw	**3**	**B2** for $28x^{10}$ and $56x^{13}$ OR $[x^8](28x^2)$ and $[x^8](56x^5)$ or **B1** for $28x^{10}$ or $56x^{13}$ OR $[x^8](28x^2)$ or $[x^8](56x^5)$
7(b)(i)	$n = 10$	**2**	**B1** for the correct term in any form e.g. ${}^nC_5x^{n-5}\left(\frac{2}{x}\right)^5$ or for $n - 5 = 5$ oe, soi
7(b)(ii)	8064	**2**	**B1** for ${}^{10}C_5 \times 2^5$ oe e.g. 252×32

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Question	Answer	Marks	Partial marks
8(a)	$[x =]\ \frac{\pi}{24}, \frac{5\pi}{24}$ and no extras in range	**2**	**B1** for $[x =]\ \frac{\pi}{24}$ or $\frac{5\pi}{24}$ ignoring extras or for $4x = \frac{\pi}{6}$ **and** $\frac{5\pi}{6}$ soi
8(b)	Correct and complete plan soi e.g. $\int_{their\frac{\pi}{24}}^{their\frac{5\pi}{24}}\left(\sin(4x)-\frac{1}{2}\right)\mathrm{d}x$ or $2\int_{their\frac{\pi}{24}}^{\frac{\pi}{8}}\left(\sin(4x)-\frac{1}{2}\right)\mathrm{d}x$	**M1**	**FT** *their* limits in radians from part (a) or $\int_{their\frac{\pi}{24}}^{their\frac{5\pi}{24}}\sin 4x\,\mathrm{d}x\ -\frac{1}{2}\left(their\frac{5\pi}{24}-their\frac{\pi}{24}\right)$
	Integrates sin 4*x*: $-\frac{1}{4}\cos 4x$	**B2**	**B1** for $k\cos 4x$ where $k < 0$ or $k = \frac{1}{4}$
	Substitutes exact limits in correct order: $-\frac{1}{4}\cos 4\left(\frac{5\pi}{24}\right)-\left[-\frac{1}{4}\cos 4\left(\frac{\pi}{24}\right)\right]$ oe soi	**M1**	**FT** *their* exact limits and *their* $-\frac{1}{4}\cos 4x$ providing at least **B1** awarded
	$\frac{\sqrt{3}}{4}-\frac{\pi}{12}$ or exact equivalent	**A1**	
9	$\frac{18+12\sqrt{10}}{2+\sqrt{10}}$	**B1**	
	$\frac{their18+(their12)\sqrt{10}}{2+\sqrt{10}}\times\frac{2-\sqrt{10}}{2-\sqrt{10}}$	**M1**	**FT** $\frac{a+b\sqrt{10}}{2+\sqrt{10}}$ where *a* and *b* are integers
	$\frac{36-18\sqrt{10}+24\sqrt{10}-120}{-6}$	**A1**	
	$14-\sqrt{10}$ nfww	**A1**	**dep** on all previous marks awarded
	Alternative		
	$\frac{16+11\sqrt{10}}{2+\sqrt{10}}\times\frac{2-\sqrt{10}}{2-\sqrt{10}}$ [+1]	**(M1)**	
	$\frac{32-16\sqrt{10}+22\sqrt{20}-110}{-6}$ [+1]	**(A1)**	
	$\frac{-78+6\sqrt{10}\ [-6]}{-6}$ oe	**(A1)**	e.g. $13-\sqrt{10}$ [+1]
	$14-\sqrt{10}$ nfww	**(A1)**	**dep** on all previous marks awarded

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