Question	Answer	Marks	Partial Marks
7(b)	$x=\pi, y=-\pi$	**B1**	or –3.14 or better
	$x=\pi, \frac{dy}{dx}=-1$	**B1**	from correct $\frac{dy}{dx}$
	gradient of normal =1	**M1**	use $m_1m_2 = -1$ with *their* grad of tangent
	$y=x-2\pi$ cso	**A1**	or $y=x-6.28$ or better fully correct solution
7(c)	$\int their(a)=x\cos x$ $\left(\int -x\sin x+\cos x dx=x\cos x\right)$	**M1**	*
	$\int \cos x dx=\sin x$	**B1**	clearly seen anywhere
	$-x\cos x+\sin x$	**A1**	implies previous marks if (a) is correct
	insert $\frac{\pi}{6}$ into *their* integral	**M1**	*** dep**
	$\frac{1}{2}-\frac{\pi\sqrt{3}}{12}$	**A1**	reject decimals
8(a)	$x^2(y+1)=8$ oe	**B1**	
	$x+2=4y$ oe	**B1**	
	$x^2\left(\frac{x+2}{4}+1\right)=8$	**M1**	eliminate *y* from correct equations
	$x^3+6x^2-32=0$	**A1**	**answer given**
8(b)	$x=2$ or $x=-4$ seen or $(x-2)$ or $(x+4)$ seen	**B1**	
	find quadratic factor	**M1**	x^2 and 16 or long division to $x^2 + kx$ or x^2 and –8 or long division to $x^2 + kx$ not from expanding two linear factors
	$(x^2+8x+16)$ or (x^2+2x-8)	**A1**	
	$(x-2)(x+4)^2$ and $x=2,-4,-4$	**A1**	answer only without working earns B1 above only

Question	Answer	Marks	Partial Marks
8(c)	no real value for $\log_2(-4)$ or $\log_2(-4+2)$	**B1**	must identify specific term in one of original equations and use $x = -4$
	$y=1$	**B1**	
9(a)	$(AC=)\ \sqrt{300^2+x^2}$ seen isw	**B1**	
	time for $AC=\dfrac{\sqrt{300^2+x^2}}{0.9}$ oe or time for $CD=\dfrac{400-x}{1.5}$ oe	**M1**	using clearly indicated value for *their AC* or *their CD*
	$T=\dfrac{\sqrt{300^2+x^2}}{0.9}+\dfrac{400-x}{1.5}$ oe seen isw	**A1**	
9(b)	$\dfrac{\mathrm{d}T}{\mathrm{d}x}=\dfrac{1}{2}\dfrac{\left(300^2+x^2\right)^{-\frac{1}{2}}}{0.9}\times 2x\ -\dfrac{2}{3}$ oe	**B2**	accept unsimplified; if incorrect allow B1 for correct differentiation of $\left(300^2+x^2\right)^{\pm\frac{1}{2}}$
	set *their* $\dfrac{\mathrm{d}T}{\mathrm{d}x}=0$	**M1**	$\dfrac{\mathrm{d}T}{\mathrm{d}x}$ must be a function of x
	$25x^2=9\left(300^2+x^2\right)$ oe	**A1**	equation in x^2 with square root removed
	$x=225$ (m)	**A1**	
	$T=533$ (s) or 1600/3 (exact value)	**A1**	or 8 min 53 s
10(a)	use S_4 or S_8	**M1**	
	$S_4=\dfrac{4}{2}[2a+3d]=38\quad(2a+3d=19)$	**A1**	accept unsimplified
	$S_8=\dfrac{8}{2}[2a+7d]=38+86\ (2a+7d=31)$ or $S_8-S_4=\dfrac{8}{2}[2a+7d]-\dfrac{4}{2}[2a+3d]=86$ $(4a+22d=86)$	**A1**	accept unsimplified
	solve correct equations for a or d	**M1**	
	$a=5$ and $d=3$	**A1**	