Question	Answer	Marks	Partial Marks
10	$A(1.5, 3.75)$ soi	**B1**	
	Factorises or solves $3+2x-x^2=0$	**M1**	
	$C(3, 0)$ soi	**A1**	implies **M1**
	$\frac{dy}{dx}=2-2x$, when $x = 1.5$ $\frac{dy}{dx}=-1$	**B1**	
	$y-3.75=-(x-1.5)$ oe leading to $B(5.25, 0)$ soi	**B2**	**B1** for $y-3.75=-(x-1.5)$ oe
	$\frac{1}{2}\times(5.25-1.5)\times 3.75$ $5.25^2-\frac{5.25^2}{2}-\left(5.25(1.5)-\frac{1.5^2}{2}\right)$	**B1**	OR $\frac{1}{2}\times(5.25-3)\times 2.25$ $5.25^2-\frac{5.25^2}{2}-\left(5.25(3)-\frac{3^2}{2}\right)$
	$\left[\int_{1.5}^{3}(3+2x-x^2)\,dx=\left[F(x)\right]_{1.5}^{3}=\right]$ $\left[3x+\frac{2x^2}{2}-\frac{x^3}{3}\right]_{1.5}^{3}$	**M1**	OR $\left[\int_{1.5}^{3}(2.25-3x+x^2)\,dx=\left[G(x)\right]_{1.5}^{3}=\right]$ $\left[2.25x-\frac{3x^2}{2}+\frac{x^3}{3}\right]_{1.5}^{3}$ oe
	$\left(their\ \frac{225}{32}\right)-\left(F(3)-F(1.5)\right)$	**M1**	**dep** on at least 2 correct terms in the integration OR $\left(G(3)-G(1.5)\right)+\left(their\ \frac{81}{32}\right)$
	$\frac{117}{32}$ or 3.65625	**A1**	
11(a)	$[S_{20}=]\frac{20}{2}\{2a+19d\}=1100$ oe	**B1**	
	$[S_{70}=]\frac{70}{2}\{2a+69d\}=14350$ oe	**B1**	
	Solves *their* linear equations in a and d	**M1**	**dep** on at least **B1** and an attempt to form the other equation using the sum formula
	$a=-2$, $d=6$	**A2**	**A1** for each
	$[u_{12}=-2+11\times 6=]\,64$	**B1**	

Question	Answer	Marks	Partial Marks
11(b)	$\frac{x-9}{x+6}=\frac{\frac{1}{2}(x+1)}{x-9}$ or $(x-9)\left(\frac{x-9}{x+6}\right)=\frac{1}{2}(x+1)$ $(x+6)\left(\frac{x-9}{x+6}\right)^2=\frac{1}{2}(x+1)$ oe	**M2**	**M1** for either $\frac{x-9}{x+6}$ or $\frac{\frac{1}{2}(x+1)}{x-9}$; may be embedded
	Correct simplification to given equation $x^2-43x+156=0$	**A1**	
	Factorises or solves: $(x-4)(x-39)=0$	**M1**	
	$x=4, x=39$	**A1**	
	$r=-\frac{1}{2}$ $r=\frac{2}{3}$ $\lvert r\rvert<1$ for each progression [and so the sum to infinity exists]	**A2**	**A1** for either value of r
12	$\frac{\pi x^2 y}{2}=25000$ oe	**M1**	
	$y=\frac{50000}{\pi x^2}$ or $\pi xy=\frac{50000}{x}$	**A1**	
	$S=\pi x\left(\frac{50000}{\pi x^2}\right)+\pi x^2$	**M1**	**FT** *their y* providing of the form $\frac{k}{\pi x^2}$
	$S=\frac{50000}{x}+\pi x^2$	**A1**	
	$\frac{dS}{dx}=-50000x^{-2}+2\pi x$ oe	**M1**	FT from expression of form $\frac{k}{x}+m\pi x^2$
	Equates to zero and solves for x: $x=\sqrt[3]{\frac{25000}{\pi}}$ or 19.9647....	**A1**	
	$S_{\min}=\frac{50000}{\sqrt[3]{\frac{25000}{\pi}}}+\pi\left(\sqrt[3]{\frac{25000}{\pi}}\right)^2$	**DM1**	**dep** on previous **M1;** **FT** *their* positive value of x used in a correct expression for S
	3760 or 3756 to 3757	**A1**	

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