Question Number	Scheme	Marks
9	(a)	
	$y = \int \left(x^3 - 3x^2 - x + 3\right) \mathrm{d}x$	
	$y = \frac{1}{4}x^4 - x^3 - \frac{1}{2}x^2 + 3x \quad (+c)$	M1A1
	Through $(0,4) \Rightarrow c = 4$	
	$y = \frac{1}{4}x^4 - x^3 - \frac{1}{2}x^2 + 3x + 4$	B1
	(b)	
	$\frac{\mathrm{d}y}{\mathrm{d}x} = \mathrm{f}'(x) = x^3 - 3x^2 - x + 3$	
	$\mathrm{f}'(-1) = -1 - 3 + 1 + 3 = 0$	M1A1
	$\mathrm{f}'(3) = 27 - 27 - 3 + 3 = 0$	A1
	(or divide/factorise, $(x+1)(x-3)(x-1) = 0$)	(M1,A1A1)
	$\frac{\mathrm{d}^2y}{\mathrm{d}x^2} = 3x^2 - 6x - 1$	M1
	$x = -1 \quad \frac{\mathrm{d}^2y}{\mathrm{d}x^2} = 3 + 6 - 1 > 0 \quad \therefore$ min at $x = -1$	A1
	$x = 3 \quad \frac{\mathrm{d}^2y}{\mathrm{d}x^2} = 27 - 18 - 1 > 0 \quad \therefore$ min at $x = 3$	A1
	(c)	
	(i) $\mathrm{f}'(x) = (x+1)(x-3)(x-1) = 0 \qquad \mathrm{f}'(1) = 0$	M1
	$y = \frac{1}{4} - 1 - \frac{1}{2} + 3 + 4 = 5\frac{3}{4}$	A1
	(ii) $x = 1 \quad \frac{\mathrm{d}^2y}{\mathrm{d}x^2} = 3 - 6 - 1 < 0 \quad \therefore$ max.	A1
	(d) Increasing for $-1 < x < 1$, and $x > 3$	B1,B1

Question Number	Scheme	Marks
10	(a) $a+ar^2=104$ $ar+ar^2=24$ $\frac{1+r^2}{r+r^2}=\frac{13}{3}$ $3+3r^2=13r+13r^2 \qquad 10r^2+13r-3=0$ $(5r-1)(2r+3)=0 \qquad r=\frac{1}{5} \quad \left(r=-\frac{3}{2}\right)$	M1 (either) A1 (both) M1A1
	(b) $r=\frac{1}{5} \quad a\left(1+\frac{1}{25}\right)=104$	M1
	$a=\frac{25}{26}\times 104=100$	A1
	$S=\frac{100}{1-\frac{1}{5}}=125$	M1A1
	(c) $r'=-\frac{3}{2}$	B1
	(d) $a'\left(1+\frac{9}{4}\right)=104, \quad a'=\frac{4}{13}\times 104=32$	M1A1
	$\frac{32\left(1-\left(-\frac{3}{2}\right)^n\right)}{1+\frac{3}{2}}=125$	M1
	$-\left(-\frac{3}{2}\right)^n=\frac{561}{64}$	A1
	solve $\left(\frac{3}{2}\right)^n=\frac{561}{64} \qquad n=\frac{\log\left(\frac{561}{64}\right)}{\log\left(\frac{3}{2}\right)}=5.35...$	M1 (log or ln)
	n must be odd $\quad \therefore n=7$	A1

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