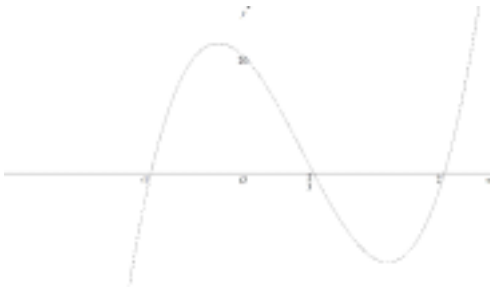
Question	Answer	Marks	Guidance
1(a)		**3**	**B1** for a well-drawn cubic graph in the correct orientation with both arms extending beyond *x*-axis **B1** for $x=-1$, $x=2$ and $x=\frac{2}{3}$ either on the graph or stated with a cubic graph **B1** for $y=20$ either on the graph or stated with a cubic graph
1(b)	$-1<x<\frac{2}{3}$	**B1**	Must be found from a cubic graph
	$x>2$	**B1**	
2	$\left[\ln(x-1)+\frac{1}{x-1}\right]_3^5$	**2**	**B1** for $\ln(x-1)$ **B1** for $+\frac{1}{x-1}$
	$\left(\ln 4+\frac{1}{4}\right)-\left(\ln 2+\frac{1}{2}\right)$	**M1**	**Dep** on at least one B mark, for correct use of limits
	$\ln 2-\frac{1}{4}$	**2**	**A1** for $\ln 2$ **A1** for $-\frac{1}{4}$ oe
3(a)	$\text{p}(2):\ 8a-36+2b-6=0$	**B1**	
	$\text{p}(3):\ 27a-81+3b-6=66$	**B1**	
		M1	**Dep** on at least one of the previous B marks, for attempt to solve *their* equations and obtain a solution for both *a* and *b*
	$a=6,\ \ b=-3$	**A1**	For both
3(b)	$(x-2)(6x^2+3x+3)$	**2**	**M1** for attempt at quadratic factor either by observation to obtain $6x^2+px+3$ or by algebraic long division to obtain at least $6x^2+3x...$ **A1** all correct

Question	Answer	Marks	Guidance
3(c)	Discriminant of $\mathrm{q}(x) = 3^2 - 4\times6\times3$ $= -63$ which is < 0	**M1**	For calculation of discriminant and confirmation that it is < 0
	$\mathrm{q}(x) = 0$ has no real solutions hence $\mathrm{p}(x) = 0$ has only one real solution	**A1**	For a correct conclusion from correct work.
4	$(a+x)^3 = a^3 + 3a^2x + 3ax^2\left[+x^3\right]$	**B1**	
	$\left(1-\frac{x}{3}\right)^5 = 1 - \frac{5}{3}x + \frac{10}{9}x^2 \ldots$	**2**	**M1** allow one sign error or one arithmetic slip
	$a^3 = 27, \quad a = 3$	**B1**	
	Term in x: $3a^2 - \frac{5}{3}a^3 = b$	**M1**	For multiplying *their* terms, must have sum of 2 relevant products = b
	$b = -18$	**A1**	
	Term in x^2 : $3a - \frac{5}{3}\left(3a^2\right) + \frac{10}{9}a^3 = c$	**M1**	For multiplying *their* terms, must have sum of 3 relevant products = c
	$c = -6$	**A1**	
5(a)	$\mathrm{f} \geqslant -4$	**2**	**M1** for a valid method to find the least value of $x^2 + 4x$ **A1** for $\mathrm{f} \geqslant -4$, $y \geqslant -4$ or $\mathrm{f}(x) \geqslant -4$
5(b)	$\mathrm{g} > 1$	**B1**	Allow $y > 1$ or $\mathrm{g}(x) > 1$
5(c)	$\left(1+\mathrm{e}^{2x}\right)^2 + 4\left(1+\mathrm{e}^{2x}\right)[=21]$	**M1**	
	$\mathrm{e}^{4x} + 6\mathrm{e}^{2x} - 16 = 0$ $\left(\mathrm{e}^{2x}+8\right)\left(\mathrm{e}^{2x}-2\right) = 0$	**M1**	**Dep** for quadratic in terms of e^{2x} and attempt to solve to obtain $\mathrm{e}^{2x} = k$
	$\mathrm{e}^{2x} = 2$ $x = \frac{1}{2}\ln k$	**M1**	**Dep** on both previous M marks, for attempt to solve $\mathrm{e}^{2x} = k$
	$x = \ln\sqrt{2}$ or $\ln 2^{\frac{1}{2}}$	**A1**	
6(a)(i)	720	**B1**	
6(a)(ii)	480	**B1**	