Question			Answer	Marks	AO	Guidance	
3	**(a)**		$\mathrm{f}(x + h) - \mathrm{f}(x) =$ $((x + h)^2 + 2(x + h)) - (x^2 + 2x)$	**M1**	**2.1**	Attempt expression for $\mathrm{f}(x + h) - \mathrm{f}(x)$	Allow sign error from no bracket around final term, ie $(x + h)^2 + 2(x + h) - x^2 + 2x$ is **M1**, but no other errors allowed If considering x^2 and $2x$ separately then expressions for both must be seen
			$= x^2 + 2xh + h^2 + 2x + 2h - x^2 - 2x$ $= 2xh + h^2 + 2h$	**M1**	**2.1**	Expand and simplify $\mathrm{f}(x + h) - \mathrm{f}(x)$	Expand and gather like terms (either separately, or single expression) Condone sign errors only, so M0 if collecting like terms after an incorrect attempt to divide by h Allow BOD if $2x\ldots + 2x$ becomes 0 rather than $4x$
			$\dfrac{\mathrm{f}(x + h) - \mathrm{f}(x)}{h} = \dfrac{2xh + h^2 + 2h}{h}$ $= 2x + h + 2$	**M1**	**2.1**	Attempt $\dfrac{\mathrm{f}(x + h) - \mathrm{f}(x)}{h}$	Divide **all** terms by h Allow BOD if previous error results in a term with a denominator of h
			$\mathrm{f}\,'(x) = \lim_{h \to 0}(2x + h + 2) = 2x + 2$	**A1**	**2.5**	Complete proof by considering limit as $h \to 0$	www, including correct signs throughout Must divide by h before $h \to 0$ Must see 'lim', '$h \to 0$', and $\mathrm{f}\,'(x)$ at some point in their solution and not just when quoting the generic formula, but allow BOD for $\mathrm{f}\,'(x) = \frac{\mathrm{f}(x+h)-\mathrm{f}(x)}{h}$ followed by =…, =…, =… on subsequent lines **A0** if 'lim' still in final answer Condone $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ in place of $\mathrm{f}\,'(x)$
				[4]			

Question			Answer	Marks	AO	Guidance	
3	**(b)**		$y = x^2 + 2x + c$	**B1**	**2.2a**	State or imply correct equation, including $+ c$	'$y =$' could be implied by use of 5 c may be implied by later work
			$5 = 1 - 2 + c$ $c = 6$	**M1**	**1.1**	Attempt c using $(-1, 5)$	Allow **M1** if equation incorrect, as long as from attempt at integrating $2x + 2$ ie of form $y = kx^2 + 2x + c$ c may be implied by method eg $y = x^2 + 2x$, followed by $5 = 1 - 2$ and then an attempt to 'balance' the sides Must use x and y the correct way around As far as attempting a value for c
			$y = x^2 + 2x + 6$	**A1**	**1.1**	Obtain correct equation, including $y = ...$	Equation must be stated, and not just implied by $c = 6$ seen Allow f$(x) = …$ **A0** for 'equation' $= x^2 + 2x + 6$
				[3]			Just stating $y = x^2 + 2x + 6$ or $y = (x + 1)^2 + 5$ gets full marks (may come from observing that $(-1, 5)$ is the minimum point)