

Question		Answer	Marks	AO	Guidance	
8	(a)	$f(x+h) = a(x+h)^2 + b(x+h)$ $= a(x^2 + 2xh + h^2) + b(x+h)$ $f(x+h) - f(x)$ $= (ax^2 + 2ahx + ah^2 + bx + bh) - (ax^2 + bx)$ $= 2xah + ah^2 + bh$ $\frac{f(x+h) - f(x)}{h} = 2ax + ah + b$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = 2ax + b$	M1 A1 A1 A1	2.1 1.1 1.1 2.2a	Considers $f(x+h)$ and attempts to expand bracket squared Correct simplified expression for $f(x+h) - f(x)$ Correct simplified expression cao – must be explicit that the limit (and not simply $h = 0$) is considered	
8	(b)	$\int (ax^2 + bx) dx = \frac{1}{3}ax^3 + \frac{1}{2}bx^2 (+c)$ $\int_1^4 (ax^2 + bx) dx = \left(\frac{64}{3}a + 8b\right) - \left(\frac{1}{3}a + \frac{1}{2}b\right) (= 21a + \frac{15}{2}b)$ $21a + \frac{15}{2}b = 9$ $(f'(4) =) 8a + b = -0.75$ $a = -0.375, b = 2.25$ $y = -0.375x^2 + 2.25x \text{ with } x = 4 \text{ gives } y = 3$ $\text{Equation of tangent: } y - 3 = -0.75(x - 4)$ $0 - 3 = -0.75(k - 4) \Rightarrow k = 8$	M1* M1dep* M1 B1 A1 M1 A1	2.1 1.1 3.1a 1.1 1.1 1.1 2.2a	Attempt to integrate (with at least one term correct) Correct use of limits $x = 1$ and $x = 4$ in their integrated expression (need not be simplified) Dependent on both previous M marks – setting up an equation in a and b using the area of shaded region Correct equation in a and b BC (oe) Sets up the equation of the tangent at $x = 4$ using 4, -0.75 and their y value at $x = 4$ (dependent on all previous M marks) or for $-\frac{\text{their } y}{k - 4} = -0.75$	Equation of tangent may have y set to 0 and x equal to k