

Question	Scheme	Marks	AOs
<b>14 (a)</b>	Deduces $g(x) = ax^3 + bx^2 + ax$	B1	2.2a
	Uses $(2,9) \Rightarrow 9 = 8a + 4b + 2a$ $\Rightarrow 10a + 4b = 9$	M1 A1	2.1 1.1b
	Uses $g'(2) = 0 \Rightarrow 0 = 12a + 4b + a$ $\Rightarrow 13a + 4b = 0$	M1 A1	2.1 1.1b
	Solves simultaneously $\Rightarrow a, b$	dM1	1.1b
	$g(x) = -3x^3 + \frac{39}{4}x^2 - 3x$	A1	1.1b
		(7)	
<b>(b)</b>	Attempts $g''(x) = -18x + \frac{39}{2}$ and substitutes $x = 2$	M1	1.1b
	$g''(2) = -\frac{33}{2} < 0$ hence maximum	A1	2.4
		(2)	
<b>(9 marks)</b>			

Notes

- (a)
- B1:**

Uses the information given to deduce that  $g(x) = ax^3 + bx^2 + ax$ . (Seen or implied)
- M1:**

Uses the fact that  $(2,9)$  lies on the curve so uses  $x = 2, y = 9$  within a cubic function
- A1:**

For a simplified equation in just two variables. E.g.  $10a + 4b = 9$
- M1:**

Differentiates their cubic to a quadratic and uses the fact that  $g'(2) = 0$  to obtain an equation in  $a$  and  $b$ .
- A1:**

For a different simplified equation in two variables E.g.  $13a + 4b = 0$
- dM1:**

Solves simultaneously  $\Rightarrow a = ..., b = ...$  It is dependent upon the B and both M's
- A1:**

$g(x) = -3x^3 + \frac{39}{4}x^2 - 3x$
- (b)
- M1:**

Attempts  $g''(x) = -18x + \frac{39}{2}$  and substitutes  $x = 2$ . Award for second derivatives of the form  $g''(x) = Ax + B$  with  $x = 2$  substituted in.  
Alternatively attempts to find the value of their  $g'(x)$  or  $g(x)$  either side of  $x = 2$  ( by substituting a value for  $x$  within 0.5 either side of 2)
- A1:**

$g''(2) = -\frac{33}{2} < 0$  hence maximum. (allow embedded values but they must refer to the sign or that it is less than zero)  
If  $g'(x) = -9x^2 + \frac{39}{2}x - 3$  or  $g(x) = -3x^3 + \frac{39}{4}x^2 - 3x$  is calculated either side of  $x = 2$  then the values must be correct or embedded correctly (you will need to check these) they need to compare  $g'(x) > 0$  to the left of  $x = 2$  and  $g'(x) < 0$  to the right of  $x = 2$  or  $g(x) < 9$  to the left and  $g(x) > 9$  to the right of  $x = 2$  hence maximum.
- Note

If they only sketch the cubic function  $g(x) = -3x^3 + \frac{39}{4}x^2 - 3x$  then award M1A0