

Question	Scheme	Marks	AOs
<b>6(a)(i)</b>	$\frac{dy}{dx} = 3ax^2 + 2bx + 12$	M1 A1	1.1b 1.1b
	$\frac{d^2y}{dx^2} = 6ax + 2b$	A1ft	1.1b
		<b>(3)</b>	
<b>(b)</b>	$\frac{13}{2} = a\left(\frac{3}{2}\right)^3 + b\left(\frac{3}{2}\right)^2 + 12\left(\frac{3}{2}\right) + 2, \quad 6a\left(\frac{3}{2}\right) + 2b = 0$ $\Rightarrow a = \dots, b = \dots$	M1	3.1a
	$a = 2, b = -9$	A1	1.1b
		<b>(2)</b>	
<b>(c)</b>	$\left(\frac{d^2y}{dx^2}\right)_{x=1} = 12(1) - 18, \quad \left(\frac{d^2y}{dx^2}\right)_{x=2} = 12(2) - 18$ <b>or</b> $\left(\frac{d^3y}{dx^3}\right)_{\left(x=\frac{3}{2}\right)} = 12$	M1	2.1
	$\left(\frac{d^2y}{dx^2}\right)_{x=1} < 0, \quad \left(\frac{d^2y}{dx^2}\right)_{x=2} > 0$ <b>or</b> $\left(\frac{d^3y}{dx^3}\right)_{\left(x=\frac{3}{2}\right)} \neq 0$ Hence point of inflection	A1	2.2a
		<b>(2)</b>	

**(7 marks)**

### Notes

**(a)(i)**

M1: For  $x^n \rightarrow x^{n-1}$

A1: Correct expression

**(ii)**

A1ft: Correct expression (follow through their first derivative)

**(b)**

M1: Substitutes the coordinates of  $P$  into the equation of the curve and substitutes  $x = 1.5$  into their second derivative and sets = 0 and then solves 2 equations in  $a$  and  $b$ .

A1: Correct values

**(c)**

M1: Attempts to find the value of the second derivative either side of  $x = 1.5$  or attempts the third derivative.

A1: Correct work with a suitable conclusion e.g. the second derivative changes sign either side of  $x = 1.5$  or the third derivative is non-zero at  $x = 1.5$