Question	Scheme	Marks	AOs
14	$y=(x-2)^2(x+3)=(x^2-4x+4)(x+3)=x^3-1x^2-8x+12$	B1	1.1b
	An attempt to find x coordinate of the maximum point. To score this you must see either • an attempt to expand $(x-2)^2(x+3)$, an attempt to differentiate the result, followed by an attempt at solving $\frac{dy}{dx}=0$ • an attempt to differentiate $(x-2)^2(x+3)$ by the product rule followed by an attempt at solving $\frac{dy}{dx}=0$	M1	3.1a
	$y=x^3-1x^2-8x+12 \Rightarrow \frac{dy}{dx}=3x^2-2x-8$	M1	1.1b
	Maximum point occurs when $\frac{dy}{dx}=0 \Rightarrow (x-2)(3x+4)=0$ $\Rightarrow x=-\frac{4}{3}$	M1 A1	1.1b 1.1b
	An attempt to find the area under $y=(x-2)^2(x+3)$ between two values. To score this you must see an attempt to expand $(x-2)^2(x+3)$ followed by an attempt at using two limits	M1	3.1a
	Area = $\int (x^3-1x^2-8x+12)\,dx=\left[\frac{x^4}{4}-\frac{x^3}{3}-4x^2+12x\right]$	M1	1.1b
	Uses a top limit of 2 and a bottom limit of their $x=-\frac{4}{3}$ $R=\left[\frac{x^4}{4}-\frac{x^3}{3}-4x^2+12x\right]_{-\frac{4}{3}}^{2}$	M1	2.2a
	Uses $=\frac{28}{3}--\frac{1744}{81}=\frac{2500}{81}$	A1	2.1
		(9)	

(9 marks)

Notes:

B1: Expands $(x-2)^2(x+3)$ to $x^3-1x^2-8x+12$ seen at some point in their solution. It may appear just on their integral for example.

M1: This is a problem solving mark for knowing the method of finding the maximum point. You should expect to see the key points used (i) differentiation (ii) solution of their $\frac{dy}{dx}=0$

M1: For correctly differentiating their cubic with at least two terms correct (for their cubic).

M1: For setting their $\frac{dy}{dx}=0$ and solves using a correct method (including calculator methods)

A1: $\Rightarrow x = -\frac{4}{3}$

M1: This is a problem solving mark for knowing how integration is used to find the area underneath a curve between two points.

M1: For correctly integrating their cubic with at least two correct terms (for their cubic).

M1: For deducing the top limit is 2, the bottom limit is their $x = -\frac{4}{3}$ and applying these correctly within their integration.

A1: Shows above steps clearly and proceeds to $R = \frac{2500}{81}$