Question	Scheme	Marks	AOs
7(a)	$y = x^3 - 10x^2 + 27x - 23 \Rightarrow \frac{dy}{dx} = 3x^2 - 20x + 27$	B1	1.1b
	$\left(\frac{dy}{dx}\right)_{x=5} = 3\times 5^2 - 20\times 5 + 27 (= 2)$	M1	1.1b
	$y + 13 = 2(x-5)$	M1	2.1
	$y = 2x - 23$	A1	1.1b
		(4)	
(b)	Both C and l pass through $(0, -23)$ and so C meets l again on the y-axis	B1	2.2a
		(1)	
(c)	$\pm\int \left(x^3 - 10x^2 + 27x - 23 - (2x - 23)\right) dx$ $= \pm\left(\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{25}{2}x^2\right)$	M1 A1ft	1.1b 1.1b
	$\left[\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{25}{2}x^2\right]_0^5$ $= \left(\frac{625}{4} - \frac{1250}{3} + \frac{625}{2}\right)(-0)$	dM1	2.1
	$= \frac{625}{12}$	A1	1.1b
		(4)	
	(c) Alternative 1:		
	$\pm\int \left(x^3 - 10x^2 + 27x - 23\right) dx$ $= \pm\left(\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{27}{2}x^2 - 23x\right)$	M1 A1	1.1b 1.1b
	$\left[\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{27}{2}x^2 - 23x\right]_0^5 + \frac{1}{2}\times 5(23+13)$ $= -\frac{455}{12} + 90$	dM1	2.1
	$= \frac{625}{12}$	A1	1.1b
	(c) Alternative 2:		
	$\int \left(x^3 - 10x^2 + 27x\right) dx = \left(\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{27}{2}x^2\right)$	M1 A1	1.1b 1.1b
	$\left[\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{27}{2}x^2\right]_0^5 - \frac{1}{2}\times 5\times 10$	dM1	2.1
	$= \frac{625}{12}$	A1	1.1b
			(9 marks)

Notes

(a)

B1: Correct derivative

M1: Substitutes $x = 5$ into their derivative. This may be implied by their value for $\frac{dy}{dx}$

M1: Fully correct straight line method using $(5, -13)$ and their $\frac{dy}{dx}$ at $x = 5$

A1: cao. Must see the full equation in the required form.

(b)

B1: Makes a suitable deduction.

Alternative via equating l and C and factorising e.g.

$$x^3 - 10x^2 + 27x - 23 = 2x - 23$$
$$x^3 - 10x^2 + 25x = 0$$
$$x\left(x^2 - 10x + 25\right) = 0 \Rightarrow x = 0$$

So they meet on the y-axis

(c)

M1: For an attempt to integrate $x^n \to x^{n+1}$ for $\pm$"$C - l$"

A1ft: Correct integration in any form which may be simplified or unsimplified. (follow through their equation from (a))

If they attempt as 2 separate integrals e.g. $\int \left(x^3 - 10x^2 + 27x - 23\right)\,dx - \int \left(2x - 23\right)\,dx$ then award this mark for the correct integration of the curve as in the alternative.

If they combine the curve with the line first then the subsequent integration must be correct or a correct ft for their line and allow for $\pm$"$C - l$"

dM1: Fully correct strategy for the area. Award for use of 5 as the limit and condone the omission of the "– 0". **Depends on the first method mark.**

A1: Correct exact value

Alternative 1:

M1: For an attempt to integrate $x^n \to x^{n+1}$ for $\pm C$

A1: Correct integration for $\pm C$

dM1: Fully correct strategy for the area e.g. correctly attempts the area of the trapezium and subtracts the area enclosed between the curve and the x-axis. Need to see the use of 5 as the limit condoning the omission of the "– 0" **and** a correct attempt at the trapezium **and** the subtraction.

May see the trapezium area attempted as $\int \left(2x - 23\right)\,dx$ in which case the integration and use of the limits needs to be correct or correct follow through for their straight line equation.

Depends on the first method mark.

A1: Correct exact value

Note if they do $l - C$ rather than $C - l$ and the working is otherwise correct allow full marks if their final answer is given as a positive value. E.g. correct work with $l - C$ leading to $-\frac{625}{12}$ and then e.g. hence area is $\frac{625}{12}$ is acceptable for full marks.

If the answer is left as $-\frac{625}{12}$ then score A0

Alternative 2:

M1: For an attempt to integrate $x^n \to x^{n+1}$ for $(C + 23)$

A1: Correct integration for $(C + 23)$

dM1: Fully correct strategy for the area e.g. correctly attempts the area of the triangle and

subtracts from the area under the curve
Need to see the use of 5 as the limit condoning the omission of the "– 0" **and** a correct attempt at the triangle **and** the subtraction.
Depends on the first method mark.