Question	Scheme	Marks	AOs
15 (a)	Attempts both $y = 8-10\times1+6\times1^2-1^3$ and $y = 1^2-12\times1+14$	M1	1.1b
	Achieves $y = 3$ for both equations and gives a minimal conclusion / statement, e.g., $(1, 3)$ lies on both curves so they intersect at $x = 1$	A1	1.1b
		(2)	
(b)	(Curves intersect when) $x^2-12x+14 = 8-10x+6x^2-x^3$ $\Rightarrow x^3-5x^2-2x+6 = 0$	M1	1.1b
	For the key step in dividing by $(x-1)$ $x^3-5x^2-2x+6 = (x-1)\left(x^2+px\pm6\right)$	dM1	3.1a
	$x^3-5x^2-2x+6 = (x-1)\left(x^2-4x-6\right)$	A1	1.1b
	Solves $x^2-4x-6 = 0$ $(x-2)^2 = 10 \Rightarrow x = ...$	ddM1	1.1b
	$x = 2-\sqrt{10}$ only	A1	1.1b
		(5)	
			(7 marks)

Notes:

(a) **Must be seen in (a)**

M1: As scheme.

For M1 A0, allow a statement that $(1,3)$ lies on both curves without sight of the calculation.

Amongst various alternatives are:

- Setting $x^2-12x+14 = 8-10x+6x^2-x^3$ and attempting to rearrange to $x^3-5x^2-2x+6 = 0$ before substituting in $x = 1$
- Setting $x^2-12x+14 = 8-10x+6x^2-x^3$ and attempting to divide x^3-5x^2-2x+6 by $(x-1)$ either by long division or inspection

A1: For the complete mathematical argument.
Requires both correct calculations with a minimal conclusion, which may be as a preamble. e.g., in the alternatives

- as $1^3-5\times1^2-2\times1+6 = 0$, hence curves meet when $x = 1$
- $x^3-5x^2-2x+6 = (x-1)\left(x^2-4x-6\right)$ so the curves intersect when $x = 1$

(b) **Allow the use of *x* or *k* throughout this part.**

M1: Sets $x^2-12x+14 = 8-10x+6x^2-x^3$ and proceeds to a cubic equation set = 0
Must be seen or used in (b)

dM1: For the key step in realising that $(x-1)$ is a factor of the cubic.
It is for dividing by $(x-1)$ to get the quadratic factor.

For division look for their first two terms, i.e., $x^2 \pm 4x$

(This will need checking if they have made an error in rearranging the cubic.)

$$x-1\overline{)\ x^3-5x^2-2x+6}\quad x^2 \pm 4x.....$$
$$x^3-1x^2$$
$$-4x^2$$

By inspection look for the first and last term $x^3-5x^2-2x+6=(x-1)\left(x^2+px\pm 6\right)$

A1: $x^3-5x^2-2x+6=(x-1)\left(x^2-4x-6\right)$ or just x^2-4x-6 or k^2-4k-6 as their quadratic factor following algebraic division.

ddM1: Attempts to solve their $x^2-4x-6=0$, which must be a 3TQ, by completing the square or the quadratic formula, leading to an exact solution. Their quadratic factor must **not** factorise. Their quadratic "factor" may come from algebraic division that has a remainder but we will still allow them to score this mark.

If using the quadratic formula, they need to have, e.g., $\dfrac{4-\sqrt{4^2-4(-6)}}{2}$

or $\dfrac{4-\sqrt{40}}{2}$ as a minimum (i.e., they must not jump straight to $2-\sqrt{10}$ from a calculator).

A1: $k=2-\sqrt{10}$ or exact equivalent but allow the use of x e.g., $x=\dfrac{4-\sqrt{40}}{2}$

If using the quadratic formula, the discriminant must be processed.
Must come from a correct quadratic factor.
They must have discarded $2+\sqrt{10}$ if seen.