Question	Scheme	Marks
7(a)(i)	$\mathrm{f}(x)=2x^3-kx^2+14x+24 \Rightarrow \left(\mathrm{f}'(x)=\right)6x^2-2kx+14$	M1A1
	$\left(\mathrm{f}''(x)=\right)12x-2k$	A1ft
(ii)		**(3)**
(b)	$6x^2-2kx+14=12x-2k \Rightarrow 6(5)^2-2k(5)+14=12(5)-2k \Rightarrow k=...$	M1
	$k=13$	A1
		(2)
(c)	$k=13 \Rightarrow 6x^2-38x+40=0 \Rightarrow x=...$	M1
	$x="\frac{4}{3}" \Rightarrow y=12\left("\frac{4}{3}"\right)-2\times13$ or $y=6\left("\frac{4}{3}"\right)^2-2\times13\times\left("\frac{4}{3}"\right)+14$	M1
	$x=\frac{4}{3},\ y=-10$	A1
		(3)
		Total 8

Notes:

In part (a), penalise the inclusion of "+ *c*" on either derivative only once on the first occurrence.

(a)(i)

M1: For $x^3 \rightarrow \ldots x^2$ or $x^2 \rightarrow \ldots x$ or $14x \rightarrow 14$

A1: Correct simplified first derivative. The $"\mathrm{f}'(x)="$ is not required.

Do not allow x^1 for x.

Isw can be applied once a correct simplied derivative is seen.

(ii)

A1ft: Correct simplified second derivative. Follow through their first derivative

The $"\mathrm{f}''(x)="$ is not required.

Isw can be applied once a correct simplied second derivative is seen. **Must follow M1**

(b)

M1: Sets $\mathrm{f}'(x) = \mathrm{f}''(x)$, substitutes $x = 5$ and solves a linear equation in k to find a value for k.

May substitute $x = 5$ into $\mathrm{f}'(x)$ and $\mathrm{f}''(x)$ first, then equate and solve for k.

A1: $k = 13$

(c)

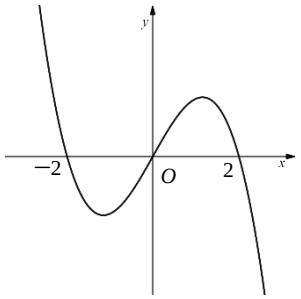
M1: Substitutes their k into the equated $\mathrm{f}'(x) = \mathrm{f}''(x)$ and solves the resulting 3TQ to obtain at least one value for x by any means including a calculator.

M1: Substitutes their x (not 5) and their k into $\mathrm{f}'(x)$ or $\mathrm{f}''(x)$ to find a value for y.

May be implied by their values so you may need to check.

A1: Correct coordinates. May be seen as $x = .., y = \ldots$ or as a coordinate pair but condone missing brackets e.g. $\frac{4}{3}, -10$. Award this mark as soon as the correct values are seen.

Allow a "made up" k in (c).

Question	Scheme	Marks
8(a)		B1B1B1
		(3)
(b)	$x\left(4-x^2\right)=\dfrac{A}{x}\Rightarrow 4x^2-x^4=A$ $\Rightarrow x^4-4x^2+A=0*$	B1*
		(1)
(c)	$A>0$	B1
	$b^2=4ac\Rightarrow 16=4A\Rightarrow A=...$	M1
	$0<A<4$	A1
		(3)
		Total 7

Notes:

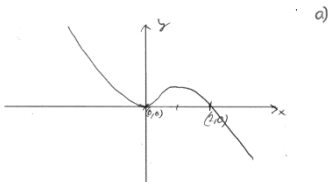
(a)

B1: Negative cubic curve in any position. Must have one maximum and one minimum.

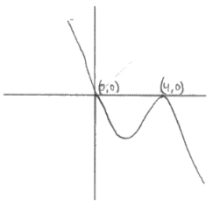
B1: Positive or negative cubic curve **passing through** (not touching) the origin.
The origin does not have to be labelled.

B1: Cuts the x-axis at $x = 2$ and $x = -2$. May be as shown or as (2, 0) and (−2, 0).
Must cut so extends beyond the x-axis from above or below but **not** a turning point.
Condone (0, 2) and (0, −2) as long as they are in the correct positions.
Allow away from the sketch but must be (2, 0) and (−2, 0).
If there is any ambiguity, the sketch takes precedence.

Examples:



100



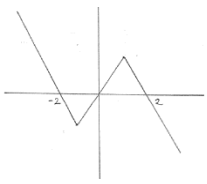
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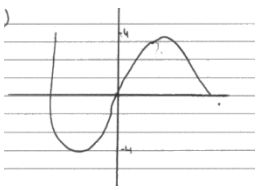
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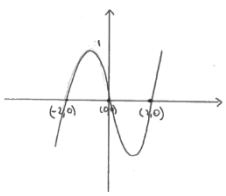
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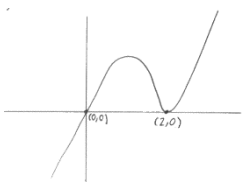
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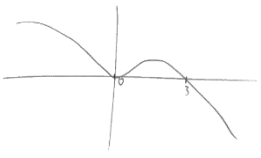
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011



010



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