Question	Scheme	Marks	AOs
11 (a)	Substitutes $x=\frac{1}{2}$ into $y=2x^3+10$ **and** $y=42x-15x^2-7$ and finds the y values for both	M1	1.1b
	Achieves $\frac{41}{4}$ o.e. for both and makes a valid conclusion. *	A1*	2.4
		(2)	
(b)	Sets $42x-15x^2-7=2x^3+10 \Rightarrow 2x^3+15x^2-42x+17=0$	M1	1.1b
	Deduces that $(2x-1)$ is a factor and attempts to divide	dM1	2.1
	$2x^3+15x^2-42x+17=(2x-1)\left(x^2+8x-17\right)$	A1	1.1b
	Solves their $x^2+8x-17=0$ using suitable method	M1	1.1b
	Deduces $x=-4+\sqrt{33}$ (see note)	A1	2.2a
		(5)	
(7 marks)			
Notes:			

(a)

M1: Substitutes $x=\frac{1}{2}$ into both $y=2x^3+10$ and $y=42x-15x^2-7$ and finds y values

Sight of just the y values at each is sufficient for this mark only.

Alternative: Sets $42x-15x^2-7=2x^3+10 \Rightarrow$ cubic and substitutes $x=\frac{1}{2}$ into the expression, attempts $\mathrm{f}\left(\frac{1}{2}\right)$ or else attempts to divide the cubic = 0 by $(2x-1)$ or $\left(x-\frac{1}{2}\right)$. Condone $\mathrm{f}\left(\frac{1}{2}\right)=0$ without calculations for this mark only.

A1*: Correct calculations must be seen with a minimal conclusion that curves intersect (at $x=\frac{1}{2}$).

E.g. $2\left(\frac{1}{2}\right)^3+10=10.25$ and $42\left(\frac{1}{2}\right)-15\left(\frac{1}{2}\right)^2-7=10.25$ so curves intersect.

Acceptable alternatives are:

$\mathrm{f}(x)=42x-15x^2-7-2x^3-10, \mathrm{f}\left(\frac{1}{2}\right)=42\left(\frac{1}{2}\right)-15\left(\frac{1}{2}\right)^2-7-2\left(\frac{1}{2}\right)^3-10=0 \Rightarrow$ so curves intersect

$\mathrm{f}(x)=2x^3+15x^2-42x+17 \Rightarrow \left(x-\frac{1}{2}\right)\left(2x^2+16x-34\right)$ so $x=\frac{1}{2}$ is a root so curves intersect

$\mathrm{f}(x)=2x^3+15x^2-42x+17 \Rightarrow (2x-1)\left(x^2+8x-17\right)$ so $(2x-1)$ is a factor hence curves intersect

Only accept verified, QED etc if there is a preamble mentioning intersection about how it will be shown.

Special case: Scores M1 A0 with or without a conclusion

This is presumably done using a calculator and requires all three roots exact or correct to 3sf

$\mathrm{f}(x)=2x^3+15x^2-42x+17=0$

$\Rightarrow x=0.5, 1.74, -9.74$

(b) **This part requires candidates to show all stages of their working.**
Answers without working will not score any marks
A method must be seen which could be from part (a) which must then be continued in (b)

M1: Sets $42x-15x^2-7=2x^3+10$ and proceeds to 4 term cubic equation.
Condone slips, e.g. signs. Terms do not have to be on one side of the equation.

dM1: For the key step in attempting to "divide" the cubic by $(2x-1)$
If attempted via inspection look for correct first and last terms
E.g. $2x^3+15x^2-42x+17=(2x-1)(x^2+...\pm 17)$ if cubic expression is correct
If attempted via division look for correct first and second terms

$$\begin{array}{r} x^2+8x \qquad\qquad \\ 2x-1\overline{\big)\,2x^3+15x^2-42x+17} \end{array}$$ if cubic expression is correct

It is acceptable for an attempt to divide by $\left(x-\frac{1}{2}\right)$. It is easily marked using the same guidelines, e.g. $2x^3+15x^2-42x+17=\left(x-\frac{1}{2}\right)(2x^2+16x...)$

A1: $2x^3+15x^2-42x+17=(2x-1)(x^2+8x-17)$ o.e. $\left(x-\frac{1}{2}\right)(2x^2+16x-34)$
This may be implied by sight of $(x^2+8x-17)$ or $(2x^2+16x-34)$ in a "division" sum.

M1: Solves their quadratic $x^2+8x-17=0$ using a suitable method including calculator. You may need to check this. It is not completely dependent upon the previous M's but an attempt at a full method must have been seen. So look for

- the two equations being set equal to each other and some attempt made to combine
- some attempt to "divide" the result by $(2x-1)$ o.e. allowing for flaws in the method

A1: Gives $x=-4+\sqrt{33}$ o.e. only. The $x=-4-\sqrt{33}$ must not be included in the final answer.
Allow exact unsimplified equivalents such as $x=\dfrac{-8+\sqrt{132}}{2}$. ISW for instance if they then put this in decimal form.