Question	Scheme	Marks	AOs
9(a)	$(\mathrm{g}(-2)) = 4\times-8-12\times4-15\times-2+50$	M1	1.1b
	$\mathrm{g}(-2)=0 \Rightarrow (x+2)$ is a factor	A1	2.4
		(2)	
(b)	$4x^3-12x^2-15x+50=(x+2)(4x^2-20x+25)$	M1 A1	1.1b 1.1b
	$=(x+2)(2x-5)^2$	M1 A1	1.1b 1.1b
		(4)	
(c)	(i) $x \leqslant -2,\ x=2.5$	M1 A1ft	1.1b 1.1b
	(ii) $x=-1,\ x=1.25$	B1ft	2.2a
		(3)	
		(9 marks)	

(a)

M1: Attempts $\mathrm{g}(-2)$ Some sight of (-2) embedded or calculation is required.

So expect to see $4\times(-2)^3-12\times(-2)^2-15\times(-2)+50$ embedded

Or $-32-48+30+50$ condoning slips for the M1

Any attempt to divide or factorise is M0. (See demand in question)

A1: $\mathrm{g}(-2)=0 \Rightarrow (x+2)$ is a factor.

Requires a correct statement and conclusion. Both "$\mathrm{g}(-2)=0$" and "$(x+2)$ is a factor" must be seen in the solution. This may be seen in a preamble before finding $\mathrm{g}(-2)=0$ but in these cases there must be a minimal statement ie QED, "proved", tick etc.

Also accept, in one coherent line/sentence, explanations such as, 'as g (x) =0 when $x=-2$, $(x+2)$ is a factor.'

(b)

M1: Attempts to divide $\mathrm{g}(x)$ by $(x+2)$ May be seen and awarded from part (a)

If inspection is used expect to see $4x^3-12x^2-15x+50=(x+2)(4x^2\,\ldots\ldots\ldots\ldots\pm25)$

If algebraic / long division is used expect to see

$$\begin{array}{r} 4x^2\pm20x \\ x+2\,\overline{\smash{)}\,4x^3-12x^2-15x+50} \end{array}$$

A1: Correct quadratic factor is $(4x^2-20x+25)$ may be seen and awarded from part (a)

M1: Attempts to factorise their $(4x^2-20x+25)$ usual rule $(ax+b)(cx+d),\ ac=\pm4, bd=\pm25$

A1: $(x+2)(2x-5)^2$ oe seen on a single line. $(x+2)(-2x+5)^2$ is also correct.

Allow recovery for all marks for $\mathrm{g}(x)=(x+2)(x-2.5)^2=(x+2)(2x-5)^2$

(c)(i)

M1: For identifying that the solution will be where the curve is on or below the axis. Award for either $x\leqslant-2$ or $x=2.5$ Follow through on their $\mathrm{g}(x)=(x+2)(ax+b)^2$ only where $ab<0$ (that is a positive root). Condone $x<-2$ See SC below for $\mathrm{g}(x)=(x+2)(2x+5)^2$

A1ft: BOTH $x \leqslant -2$, $x = 2.5$ Follow through on their $-\frac{b}{a}$ of their $\mathbf{g}(x) = (x+2)(ax+b)^2$

May see $\{x \leqslant -2 \cup x = 2.5\}$ which is fine.

(c) (ii)

B1ft: For deducing that the solutions of $\mathbf{g}(2x) = 0$ will be where $x = -1$ and $x = 1.25$

Condone the coordinates appearing $(-1, 0)$ and $(1.25, 0)$

Follow through on their 1.25 of their $\mathbf{g}(x) = (x+2)(ax+b)^2$

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SC: If a candidate reaches $\mathbf{g}(x) = (x+2)(2x+5)^2$, clearly incorrect because of Figure 2, we will award

In (i) M1 A0 for $x \leqslant -2$ or $x < -2$

In (ii) B1 for $x = -1$ and $x = -1.25$

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Alt (b)	$4x^3 - 12x^2 - 15x + 50 = (x+2)(ax+b)^2$ $= a^2x^3 + (2ba + 2a^2)x^2 + (b^2 + 4ab)x + 2b^2$		
	Compares terms to get either *a* or *b*	M1	1.1b
	Either $a = 2$ or $b = -5$	A1	1.1b
	Multiplies out expression $(x+2)(\pm 2x \pm 5)^2$ and compares to $4x^3 - 12x^2 - 15x + 50$	M1	
	All terms must be compared or else expression must be multiplied out and establishes that $4x^3 - 12x^2 - 15x + 50 = (x+2)(2x-5)^2$	A1	1.1b
		(4)	