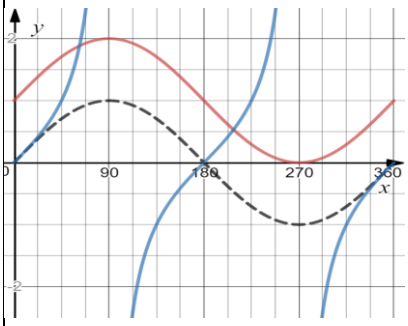
Question Number	Scheme	Marks
9. (a)	$(270°, -4)$	B1 B1 **(2)**
(b)	 For $y = 1 + \sin\theta$	B1
	$y = \tan\theta$	B1 **(2)**
(c)	(i) $6 \times 2 = 12$ (ii) 11	M1 A1 B1 ft **(3)** **(7 marks)**

(a)

B1 Either coordinate correct. Look for either $270^{(°)}$ or -4 in the correct position within (,) .

Alternatively look for either $x = 270$ or $y = -4$ Condone $\frac{3\pi}{2} = 270°$

Do not accept multiple answers unless one point is chosen or it is clearly part of their thought process.

There is no need for the degrees symbol. Condone swapped coordinates, ie $(-4, 270)$ for this mark

B1 For correct coordinates.

$(270°, -4)$ with or without degrees symbol. Condone $x = 270(°), y = -4$

(b) These may appear on Figure 3 rather than Diagram 1

B1 For $y = 1 + \sin\theta$ Score for a curve passing through $(0,1), (90°, 2), (180°, 1), (270°, 0), (360°, 1)$ with acceptable curvature. Do not accept straight lines

B1 For $y = \tan\theta$ with acceptable curvature. Must go beyond $y = 1$ and -1

Score for the general shape of the curve rather than specific coordinates. See practice and qualification items for clarification.

First quadrant from $(0,0) \rightarrow (90°, \infty)$

Second and third quadrants from $(90°, -\infty) \rightarrow (270°, \infty)$ passing through $(180°, 0)$

Fourth quadrant from $(270°, -\infty) \rightarrow (0,0)$

(c)(i) The question states hence so it is expected the results come from graphs.

If neither or only one graph is drawn then score for 12 in (i) for M1 A1 and 11 in (ii) B1

M1 For the calculation $\frac{2160}{360} = 6$ or $\frac{2160}{180} = 12$ or multiplying the number of intersections in their (b) by 6

Sight of 6 or 12 will imply this mark.

A1 12. 12 will score both marks.

(c) (ii)

B1 ft For either 11 (correct answer)

or follow through on n less than their answer to (c) (i) where n is their number of solutions in the range $180° < \theta \leqslant 360°$

Question Number	Scheme	Marks
10 (a)	$P=\left(-\frac{1}{2},0\right)$	B1 **(1)**
(b)	$\mathrm{f}(x)=(x-4)(2x+1)^2 \Rightarrow \mathrm{f}(x)=ax^3+bx^2+cx+d$	M1
	$=4x^3-12x^2-15x-4$ oe	A1
	$\mathrm{f}'(x)=12x^2-24x-15$	dM1 A1 **(4)**
(c)	Attempts $\mathrm{f}'(2.5)=12\times2.5^2-24\times2.5-15=0$	M1A1
	Finds y coordinate for $x=2.5$ $y=-54$	A1 **(3)**
(d)	$a=-\frac{1}{2},(+)\,4$	B1, B1 **(2)** **(10 marks)**

(a)

B1 $P=\left(-\frac{1}{2},0\right)$ or exact equivalent. Accept coordinates written separately.

If both $(4,0)$ and $\left(-\frac{1}{2},0\right)$ are given, then P must be identified as $\left(-\frac{1}{2},0\right)$

(b)

M1 Attempts to multiply out to form a 4 - term cubic. The terms do not have to be collected.

Look for a multiplied-out expression that would simplify to ax^3+bx^2+cx+d

A1 $4x^3-12x^2-15x-4$. The terms do not have to be collected for this mark.

dM1 Reduces the power by one in all terms. The indices must be processed.

Look for $ax^3+bx^2+cx+d \rightarrow px^2+qx+r$ with no zero constants

A1 cso $\mathrm{f}'(x)=12x^2-24x-15$ which must be fully simplified.

Cannot be awarded, for instance, from incorrect e.g. $\mathrm{f}(x)=4x^3-12x^2-15x+4$

Note: May be attempted by the product rule.

M1A1: $\mathrm{f}(x)=(x-4)(2x+1)^2 \Rightarrow \mathrm{f}'(x)=1\times(2x+1)^2+A(x-4)(2x+1)$

All 4 marks $\mathrm{f}(x)=(x-4)(2x+1)^2 \Rightarrow \mathrm{f}'(x)=1\times(2x+1)^2+4(x-4)(2x+1)$

Note that the terms do not need to be multiplied out under this method