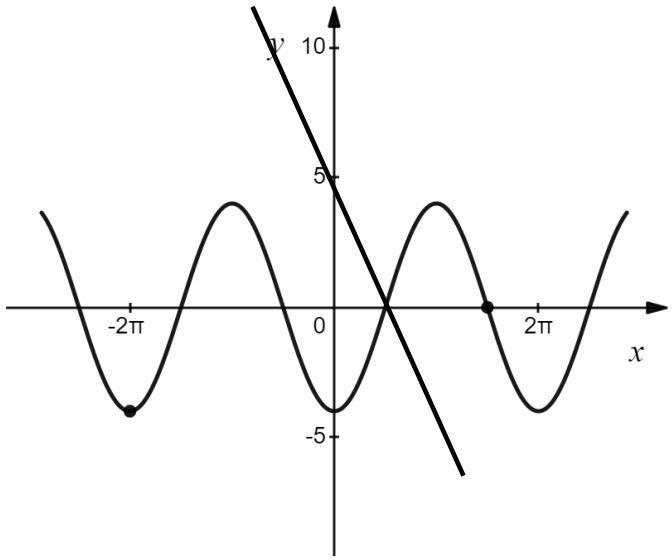
Question Number	Scheme	Marks
7 (a)(i)	$P=(-2\pi,-4)$	B1, B1
(ii)	$Q=\left(\frac{3\pi}{2},0\right)$	B1 **(3)**
(b) (i)	$k=7$	B1
(ii)	$(2\pi,3)$	M1 A1 **(3)**
(c)	 One root as there is one point of intersection	M1A1 **(2)** **(8 marks)**

NB: Watch for the answers being stated next to the question rather than in the answer space.
(a)(i) Allow all marks in (a) if *P* and *Q* are mislabelled but the coordinates are correct.

B1: For one of $(-2\pi,-4)$ Condone/allow one of $(-360°,-4)$ Condone for this B mark if the coordinates are reversed.

B1: For both of $(-2\pi,-4)$ (in correct order).

(a)(ii)

B1: $(Q=)\left(\frac{3\pi}{2},0\right)$

(b)(i)

B1: For $k=7$

(b)(ii)

M1: For one of $(2\pi,3)$ **or** follow through on the negative of their *x* coordinate of *P* or their $-4+$ their *k* Condone/allow one of $(360°,3)$ and condone for the M if the coordinates are given in the wrong order.

A1: $(2\pi,3)$ Allow $(360°,3)$ if B marks in (a) were lost due solely due to working in degrees.

(c)

M1: Draws a line with negative gradient passing through (0, 5) and cutting the graph at least once, with a consistent number of solutions for their sketch stated.

A1: Correct line drawn (intersecting at graph on the x axis) with correct deduction (one root) and reason (intersects only once).

Note use of degrees only will score a maximum of B1B0 B0 B1 M1A1 M1A0, though if the $\frac{10}{\pi}$ is converted to degrees resulting in a "correct" graph, send to review for consideration.

Question Number	Scheme	Marks
8 (a)	States or implies that gradient of tangent is 24	B1
	Solves $f'(3)=24$ to find k. E.g $4\times3^2+k\times3+3=24\Rightarrow k=...$	M1
	$3k+39=24\Rightarrow k=\dfrac{24-39}{3}=-5$ *	A1*
		(3)
(b)	$f'(x)=4x^2-5x+3\Rightarrow f(x)=\dfrac{4}{3}x^3-\dfrac{5}{2}x^2+3x+c$	M1 A1
	Substitutes $x=3, y=-\dfrac{3}{24}+5$ into $y=f(x)$ to find "c"	dM1
	$f(x)=\dfrac{4}{3}x^3-\dfrac{5}{2}x^2+3x-\dfrac{141}{8}$	A1
		(4)
		(7 marks)

Mark this question as a whole, some may try finding f(x) first in part (a), so award positively.

(a)

B1: States or implies that gradient of tangent (to the curve at P) is 24. This may occur within the use of the perpendicular condition, e.g. $f'(3)\times-\dfrac{1}{24}=-1$ implies B1.

M1: Attempts to solve $f'(3)=\pm24$ or $\dfrac{1}{24}$ (or equivalent equations) to find k. Accept as minimum at least one unsimplified equation in k before the given answer is stated. Alternatively, allow for substitution of $k=-5$ and $x=3$ into f'(x) and simplifying to a value to compare with the gradient (verification method).

A1*: Shows that $k=-5$ with at least one correct equation with simplified terms (not necessarily all gathered) and no incorrect work shown before stating the printed answer. By verification all steps must be correct with conclusion given.

(b)

M1: Integrates to a form px^3+qx^2+rx, with at least $p,q\neq0$ with no requirement for + c. Allow with k used in place of −5 for this mark.

A1: $f(x)=\dfrac{4}{3}x^3-\dfrac{5}{2}x^2+3x$ with no requirement for + c

dM1: Substitutes $x=3, y="-\dfrac{3}{24}+5"$ into $y=f(x)$ and finds a value for "c". Must have had a constant of integration.

A1: $\left(f(x)=\right)\dfrac{4}{3}x^3-\dfrac{5}{2}x^2+3x-\dfrac{141}{8}$ Accept with $y=$… instead of f(x), or even with no label at all.