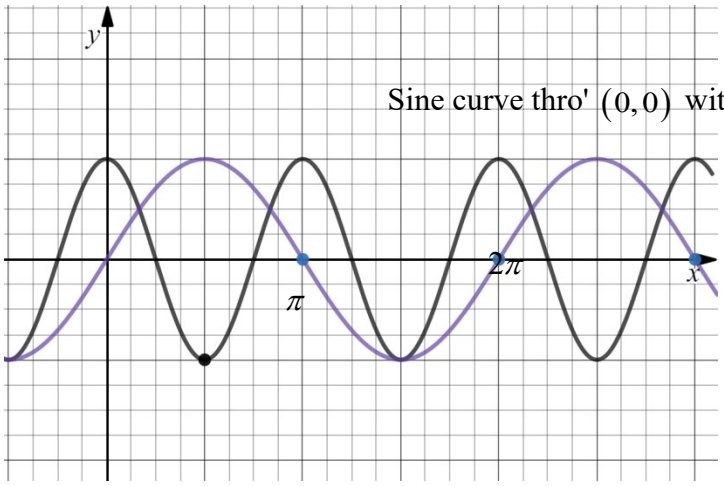
Question Number	Scheme	Marks
5. (a)	$\left(\frac{\pi}{2}, -1\right)$	B1 B1 (2)
(b)	 Sine curve thro' $(0,0)$ with max/min of ± 1	M1
	Fully correct	A1 (2)
(c)	(i) 30 but follow through on $10\times$ the number of their solutions $0 \to 2\pi$ (ii) 32	B1ft B1 (2)
		(6 marks)

(a)

B1 Either coordinate correct. They may state the coordinates separately or condone the lack of brackets for this mark. (Accept the x-coordinate as 90° or awrt 1.57 radians for this mark) If only one coordinate is stated, it must be clear if it is the x or y coordinate.

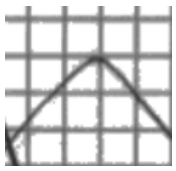
B1 For $\left(\frac{\pi}{2}, -1\right)$ or $x = \frac{\pi}{2}, y = -1$ Allow $\left[\frac{\pi}{2}, -1\right]$

SC $\left(-1, \frac{\pi}{2}\right)$ B1B0 (coordinates the wrong way round)

(b)

M1 For a sketch of a sine curve with at least one cycle starting at (or going through) the origin with the same maximum/minimum y-values as the $\cos 2x$ curve.
Condone poor/incorrect period and poor symmetry
Condone turning points appearing V shaped for this mark. If drawn on a separate diagram the maximum and minimum must appear to be ± 1 according to their axes and a complete cycle must be in the positive domain. Condone slight inaccuracies of the amplitude of their sine curve.

A1 A correct sketch of $\sin x$ between $-\frac{\pi}{2}$ and 3π. Labelling where the graph crosses the *x*-axis is not required. Turning points must appear curved. If multiple attempts are drawn and it is not clear which is their final attempt then withhold the A1.



Do not accept linear looking graphs so unless it is a clear V shape at one maximum or minimum then allow any curvature at the turning points. As a guide the curve should not go diagonally across the square either side of turning points. See graph on the right showing what is not acceptable. Where the graph crosses the *x*-axis, it must be within half a square of the correct points

(c) (i)

B1ft 30 or follow through on $10\times$ the number of their solutions between 0 and 2π (where 2π should be on the graph - see mark scheme for position) . The question said hence or otherwise so they may get B1 for 30 even if their graph does not suggest that number of solutions.

(ii)

B1 32

Question Number	Scheme	Marks
6.(a)	$f'(x) = 5x^{\frac{3}{2}} - 40$	M1A1
	Attempts $5x^{\frac{"3"}{2}} - 40 = 0 \Rightarrow x^{\frac{"3"}{2}} = ..$	M1
	$x = 4$	A1 cao (4)
(b)	$f''(x) = \frac{15}{2}x^{\frac{1}{2}} = 5$	M1
	$\Rightarrow x^{\frac{1}{2}} = .. \Rightarrow x = ..^2$ $\quad x = \frac{4}{9}$	M1 A1 (3)
		(7 marks)

(a)

M1 For reducing the power by one on either x term ($x^{\frac{5}{2}} \rightarrow x^{\frac{3}{2}}$ or $-40x \rightarrow -40$)

A1 Correct (but may be unsimplified) $\left[f'(x)\right] = 5x^{\frac{3}{2}} - 40$

M1 Attempts to solve their $f'(x) = 0 \Rightarrow x^{\frac{"3"}{2}} = ...$ by making their $x^{\frac{"3"}{2}}$ the subject. Their $f''(x)$ must be a changed function. This can be implied by their final answer. If their $f'(x) = 0$ is of the form $f'(x) = Ax^B + Cx^D$ then this mark can be awarded for taking a factor out eg. $x^B(A + Cx^{D-B})$ and doing the same as above on the terms in their bracket.

A1 $x = 4$ cao (do not accept ± 4)

(b)

M1 For reducing the power by one on one of their terms in $f'(x)$ and setting their $f''(x) = 5$

M1 For a correct method leading to $x = \ldots$ from an equation of the form $Ax^{\frac{1}{2}} = 5$.
Eg for $\frac{15}{2}x^{\frac{1}{2}} = 5$ either makes $x^{\frac{1}{2}}$ the subject and squares or squares both sides and makes x the subject. This can be implied by their final answer. Do not allow slips on the power.

A1 $x = \frac{4}{9}$ or exact equivalent

The question states that solutions based entirely on graphical or numerical methods are not acceptable. Therefore if no differentiation is shown then this will score no marks.