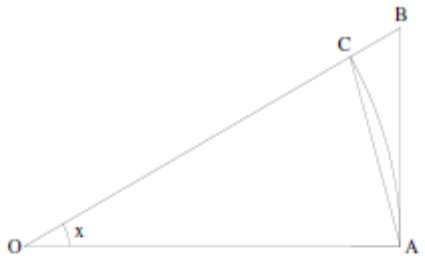
[In this question, you may assume that the derivative of $\sin x$ is $\cos x$.]



(i) In the diagram above OA and OC are of length 1 and subtend an angle x at O. The angle BAO is a right angle and the circular arc from A to C, centred at O, is also drawn.

By consideration of various areas in the above diagram, show, for $0 < x < \pi/2$, that

$$x \cos x < \sin x < x.$$

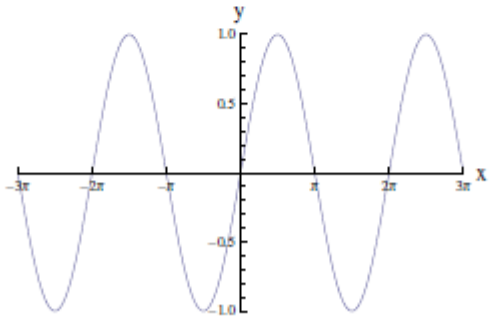
(ii) Sketch, on the axes provided on the opposite page, the graph of

$$y = \frac{\sin x}{x}, \qquad 0 < x < 4\pi.$$

Justify your value that y takes as x becomes small.

[You do not need to determine the coordinates of the turning points.]

(iii) Drawn below is a graph of $y = \sin x$. Sketch on the same axes the line $y = cx$ where $c > 0$ is such that the equation $\sin x = cx$ has *exactly 5 solutions*.



(iv) Draw the line $y = c$ on the axes on the opposite page.

(v) If X is the largest of the five solutions of the equation $\sin x = cx$, explain why $\tan X = X$.