Cambridge International AS & A Level

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Mathematics 9709/32

Paper 3 Pure Mathematics 3 October/November 2024

Question No(2)

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(a) By sketching a suitable pair of graphs, show that the equation $\cot 2x = \sec x$ has exactly one root in the interval $0 < x < \frac{\pi}{2}$.

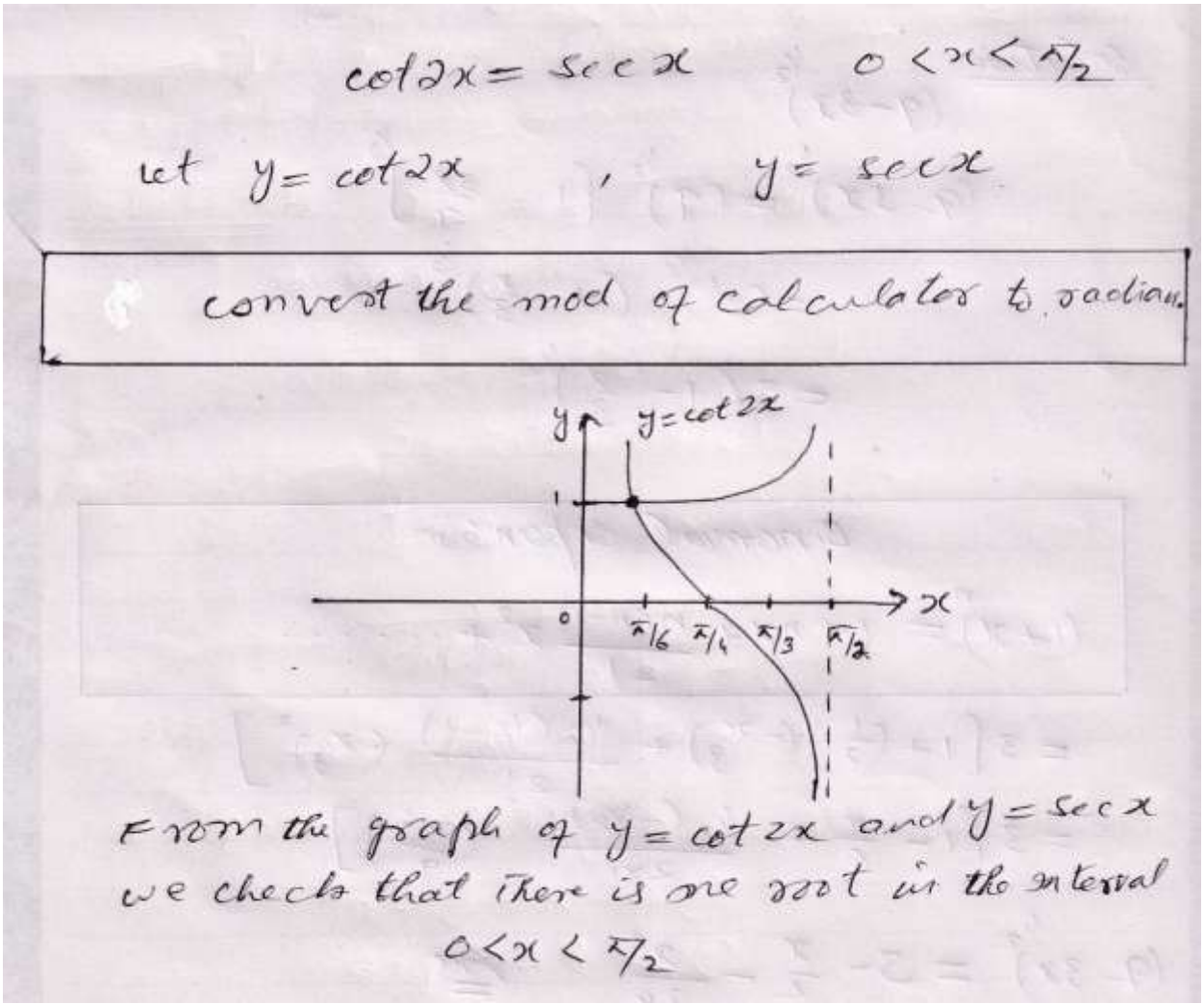
(b) Show that if a sequence of real values given by the iterative formula

$$x_{n+1} = \frac{1}{2}\tan^{-1}(cosx_n)$$

converges, then it converges to the root in part (a).

Solution:

(a)



DATE:- (3)

(b) Show that if a sequence of real values given by the iterative formula

$$x_{n+1} = \frac{1}{2}\tan^{-1}(\cos x_n)$$

converges, then it converges to the root in part (a).

Solution

As $x_{n+1} = \frac{1}{2}\tan^{-1}(\cos x_n)$

converges

$$x = \frac{1}{2}\tan^{-1}(\cos x)$$

$$2x = \tan^{-1}(\cos x)$$

$$\tan 2x = \cos x$$

$$\frac{1}{\cot 2x} = \frac{1}{\sec x}$$

$$\Rightarrow \cot 2x = \sec x$$

so from part (a) it converges to root one.