

9 (a) By sketching a suitable pair of graphs, show that the equation

$$\sec 2x = -e^x$$

has only one root in the interval $0 < x < \frac{1}{2}\pi$. [2]

(b) Show by calculation that this root lies between 0.9 and 1. [2]

This image shows a blank sheet of primary-ruled paper. It features multiple horizontal dotted lines spaced evenly apart, typical of handwriting practice paper. At the bottom center of the page, there is a small circle containing the number "1". The rest of the page is empty.

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(c)

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

converges, then it converges to the root of the equation in part (a). [1]

[1]

(d)

of each iteration to 5 decimal places.

[3]

9 The constant a is such that $\int_1^a 6x \ln x \, dx = 4$.

(a) Show that $a = \exp\left(\frac{1}{6}\left(\frac{5}{a^2} + 3\right)\right)$, where $\exp(x)$ denotes e^x . [5]

[illegible]

- [2]

[illegible]

- [3]

[illegible]

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$$|x-2|=2\sin\frac{1}{2}x$$

has only one root in the interval $0 < x < \pi$.

[2]

(b) Show by calculation that this root lies between 1 and 1.5.

[2]

5.

