Cambridge International AS & A Level

Mathematics 9709/32

Paper 3 Pure Mathematics 3 **May/June 2025**

Question No (1)

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Question No (1)

Solve the equation $\frac{e^x+2\,e^{-x}}{e^x-3} = 4$. Give your answer correct to 3 decimal places.

Solution:

DATE :-

$$\frac{e^x+2e^{-x}}{e^x-3}=4$$

$$\frac{e^x+\frac{2}{e^x}}{e^x-3}=4$$

$$\frac{e^{2x}+2/e^x}{e^x-3}=4$$

$$\frac{e^{2x}+2}{e^{2x}-3e^x}=4$$

$$e^{2x}+2=4(e^{2x}-3e^x)$$

$$e^{2x}+2=4e^{2x}-12e^x$$

$$4e^{2x}-e^{2x}-2-12e^x=0$$

$$3e^{2x}-12e^x-2=0 \rightarrow (1)$$

put $e^x=t$

$\Rightarrow e^{2x}=t^2$

Equation (1) becomes

$$3t^2-12t-2=0$$

using the quadratic formula

$a=3, \quad b=-12, \quad c=-2$

$$t = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(-2)}}{2 \times 3}$$

$$= \frac{12 \pm \sqrt{144+24}}{6}$$

$$t = \frac{12 \pm \sqrt{168}}{6}$$

$$= \frac{12 \pm \sqrt{2 \times 2 \times 42}}{6}$$

$$= \frac{2(6 \pm \sqrt{42})}{6}$$

$$t = \frac{6 \pm \sqrt{42}}{3}$$

$$t = \frac{6+\sqrt{42}}{3}$$

$$= \frac{6+6.48}{3}$$

$$t = 4.16$$

$\because t = e^x$

$e^x = 4.16$

$\ln e^x = \ln(4.16)$

$x \ln e = 1.426$

$x = 1.426$