Cambridge International AS & A Level

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Mathematics 9709/32

Paper 3 Pure Mathematics 3 **May/June 2022**

Question No (1)

1 Solve the equation $\ln(e^{2x} + 3) = 2x + \ln 3$, giving your answer correct to 3 decimal places.

Solution:

$$\ln(e^{2x} + 3) = 2x + \ln 3$$

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

$$\ln\left(\frac{e^{2x} + 3}{3}\right) = 2x \qquad \because \ln property\ , \ln\ x - \ln y = \ln\left(\frac{x}{y}\right)$$

Taking power of e on both sides

$$e^{\ln\left(\frac{e^{2x}+3}{3}\right)} = e^{2x}$$

$$\frac{e^{2x} + 3}{3} = e^{2x} \qquad \because e^{ln} = 1$$

$$e^{2x} + 3 = 3e^{2x}$$

$$3 = 3e^{2x} - e^{2x} = 2e^{2x}$$

$$3 = 2e^{2x}$$

$$e^{2x} = \frac{3}{2}$$

$$\ln e^{2x} = \ln\left(\frac{3}{2}\right)$$

$$2x \ln e = \ln\left(\frac{3}{2}\right)$$

$$x = \frac{1}{2}\ln\left(\frac{3}{2}\right) \qquad \because \ln e = 1$$

$$\mathbf{x = 0.203}$$