Integration – 2023 June A2 Math 9709

1. June/2023/Paper_9709/21/No.3(a)

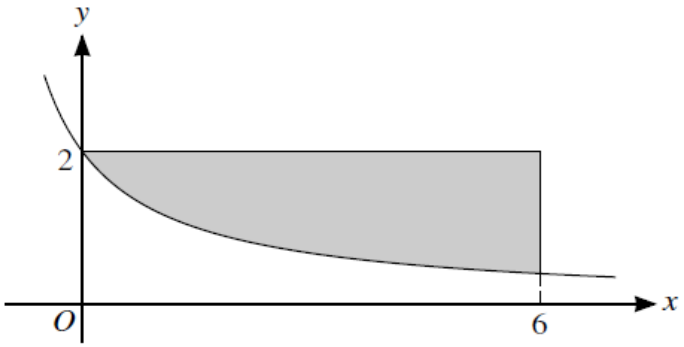
It is given that $\int_0^a (3e^{2x} - 1)\,dx = 12$, where a is a positive constant.

(a) Show that $a = \frac{1}{2}\ln(9 + \frac{2}{3}a)$. [4]

2. June/2023/Paper_9709/21/No.6

Show that $\int_{\frac{1}{4}\pi}^{\frac{1}{3}\pi} \left(4\cos^2 2x + \frac{1}{\cos^2 x}\right) \mathrm{d}x = \frac{3}{4}\sqrt{3} + \frac{1}{6}\pi - 1.$ [7]

3. June/2023/Paper_9709/22/No.3



The diagram shows part of the curve $y = \dfrac{6}{2x+3}$. The shaded region is bounded by the curve and the lines $x = 6$ and $y = 2$.

Find the exact area of the shaded region, giving your answer in the form $a - \ln b$, where a and b are integers. [5]

4. June/2023/Paper_9709/22/No.6(c)

(c) Find the exact value of $\int_0^{\frac{1}{8}\pi} 4\sin\left(2x+\frac{1}{3}\pi\right)\cos\left(2x-\frac{1}{3}\pi\right)\mathrm{d}x$. [4]