13. The curve C with equation

$$y = \frac{p - 3x}{(2x - q)(x + 3)} \qquad x \in \mathbb{R},\ x \neq 1,\ x \neq -3$$

where p and q are constants, passes through the point $(2, \frac{3}{2})$ and has two vertical asymptotes with equations $x = 1$ and $x = -3$

(a) (i) Explain why you can deduce that $q = 2$

(ii) Show that $p = 21$.

(3)

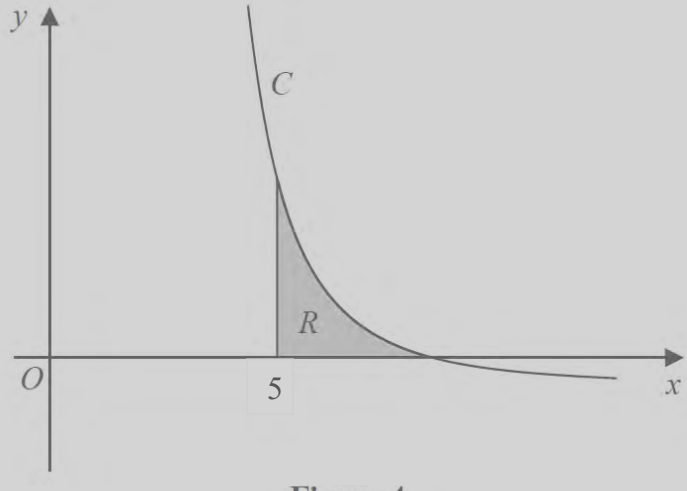

Figure 4

Figure 4 shows a sketch of part of the curve C. The region R, shown shaded in Figure 4, is bounded by the curve C, the x-axis and the line with equation $x = 5$

(b) Show that the exact value of the area of R is $a \ln 2 + b \ln 3 + c \ln 5$, where a, b and c are rational constants to be found.

(8)

(Total for Question 13 is 11 marks)