6. (a) Express $16x^2 - 48x + 40$ in the form $a(x + b)^2 + c$, where a, b and c are constants to be determined.

(2)

(b) Hence use a hyperbolic substitution to determine

$$\int \frac{1}{\sqrt{16x^2 - 48x + 40}} \, dx$$

(4)

The region R is bounded by the curve with equation $y = \dfrac{1}{\sqrt{16x^2 - 48x + 40}}$,

the x-axis, the line with equation $x = \dfrac{41}{24}$ and the line with equation $x = \dfrac{15}{8}$

(c) Using the answer to part (b) and showing all your working, determine the area of R, giving your answer in the form $p \ln q$ where p and q are rational numbers.

(3)

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Question 6 continued

(Total for Question 6 is 9 marks)