5: $$I_n = \int_1^6 x^n (3x - 2)^{-\frac{1}{2}} \, dx \qquad n \geqslant 0$$

(a) Show that, for $n \geqslant 1$

$$(3 + 6n) I_n = 4nI_{n-1} + 8 \times 6^n - 2$$

(5)

(b) Use the reduction formula in part (a) to determine the exact value of

$$\int_1^6 x^3 (3x - 2)^{-\frac{1}{2}} \, dx$$

(4)

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(Total for Question 5 is 9 marks)

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