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**2.** The functions f and g are defined by

$$f(x) = \frac{5 - x}{3x + 2} \qquad x \in \mathbb{R}, x \neq -\frac{2}{3}$$

$$g(x) = 2x - 7 \qquad x \in \mathbb{R}$$

(a) Find the value of fg(5)

**(2)**

(b) Find $f^{-1}$

**(3)**

(c) Solve the equation

$$f\left(\frac{1}{a}\right) = g(a + 3)$$

**(4)**

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**Question 2 continued**

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**Question 2 continued**

**Q2**

**(Total 9 marks)**

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**3.** **In this question you must show all stages of your working.**

**Solutions relying entirely on calculator technology are not acceptable.**

Given that $k$ is a positive constant,

(a) find

$$\int \frac{9x}{3x^2 + k} \, dx$$

**(2)**

Given also that

$$\int_2^5 \frac{9x}{3x^2 + k} \, dx = \ln 8$$

(b) find the value of $k$

**(4)**

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