2. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

The functions f and g are defined by

$$f(x) = 3 + 4e^{2x} \qquad x \in \mathbb{R}$$

$$g(x) = \sqrt{x + 5} \qquad x \in \mathbb{R} \quad x > -5$$

(a) State the range of f

(1)

(b) Find g^{-1}

(3)

(c) Find $gf\left(\ln\sqrt{7}\right)$

(2)

(d) Find the value of a, $a > 0$, for which

$$fg(a^2 - 5) = g(59)$$

giving the answer in the form $\ln p$ where p is an irrational constant.

(3)

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Question 2 continued

Question 2 continued

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Question 2 continued

(Total for Question 2 is 9 marks)

3. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

The curve C has equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = \frac{4x^2 - 14x + 15}{x - 3} \qquad x < 3$$

(a) Find $\mathrm{f}'(x)$, giving the answer in the form

$$\frac{ax^2 + bx + c}{(x-3)^2}$$

where a, b and c are constants.

(4)

(b) Hence find the coordinates of the turning point of C.

(2)

The point $P\left(\frac{5}{2}, -10\right)$ lies on C.

(c) Find the coordinates of the point to which P is mapped, when the curve with equation $y = \mathrm{f}(x)$ is transformed to the curve with equation $y = \mathrm{f}(2x) + 3$

(2)

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