5. **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

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

$$g(x) = 7 + 5e^{x-2} \qquad x \in \mathbb{R}$$

(a) State the range of f

(2)

(b) Find g^{-1}

(3)

(c) Find the exact value of a for which

$$fg(a) = 8$$

Give the answer in simplest form.

(3)

(Total for Question 5 is 8 marks)

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

$$f(x) = 3\sin x + 4\cos x$$

(a) Express $f(x)$ in the form $R\sin(x + \alpha)$, where R and α are constants,

$R > 0$ and $0 < \alpha < \frac{\pi}{2}$ giving the value of α to 3 significant figures.

(3)

$$h(x) = \left(4f(2x) - 3\right)^2 \qquad 0 < x < 2\pi$$

(b) Using the answer to part (a),

(i) write down the maximum value of $h(x)$,

(ii) find the largest value of x for which this maximum value occurs.
You must make your method clear.

(3)

(Total for Question 6 is 6 marks)