10 The function f is defined by

$$\mathrm{f} : x \mapsto 3x - 2 \quad \text{for} \quad x \in \mathbb{R}.$$

(i) Sketch, in a single diagram, the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$, making clear the relationship between the two graphs. [2]

The function g is defined by

$$\mathrm{g} : x \mapsto 6x - x^2 \quad \text{for} \quad x \in \mathbb{R}.$$

(ii) Express $\mathrm{gf}(x)$ in terms of x, and hence show that the maximum value of $\mathrm{gf}(x)$ is 9. [5]

The function h is defined by

$$\mathrm{h} : x \mapsto 6x - x^2 \quad \text{for} \quad x \geqslant 3.$$

(iii) Express $6x - x^2$ in the form $a - (x - b)^2$, where a and b are positive constants. [2]

(iv) Express $\mathrm{h}^{-1}\ x$ in terms of x. [3]