

Functions 2

1. The functions $f(x) = x^2 + x$ and $g(x) = 3x - 1$ are defined on the set of positive real numbers (\mathbb{R}^+).

(a) Evaluate i) $g(f(2))$ ii) $f(g(-1))$.

(b) Find a formula for i) $f(g(x))$

ii) $g(f(a))$

iii) $f(f(k))$

(c) Find a formula for the inverse function $g^{-1}(x)$.

2. On a suitable set of real numbers, functions f and h are defined by :

$$f(x) = \frac{2}{3x-3} \quad \text{and} \quad h(x) = \frac{1}{x^2} + 1$$

(a) Find $f(h(x))$ in its simplest form.

(b) Find a formula for the function $f^{-1}(x)$ and state a suitable domain for this inverse function.

3. Two functions f and h are defined on the set of real numbers as follows :

$$f(x) = 2x + 1 \quad , \quad h(x) = \frac{1}{x-1} \quad , \quad x \neq 1 .$$

(a) Given that $g(x) = f(h(x))$ show that $g(x)$ can be written as $g(x) = \frac{x+1}{x-1}$.

(b) Hence verify that $g^{-1}(x) = g(x)$.

4. The graph of $y = f(x)$ is shown opposite and, shown by the dotted line the graph of a related function. Write down the equation of the related function.

