Functions

(Past Year Topical Questions 2012-2017)

Oct/Nov 2012 (11)

9.

A function g is such that $g(x) = \frac{1}{2x-1}$ for $1 \leqslant x \leqslant 3$.

(i) Find the range of g. [1]

(ii) Find $g^{-1}(x)$. [2]

(iii) Write down the domain of $g^{-1}(x)$. [1]

(iv) Solve $g^2(x) = 3$. [3]

Oct/Nov 2013 (11)
12.

(a) A function f is such that $f(x) = 3x^2 - 1$ for $-10 \leqslant x \leqslant 8$.

(i) Find the range of f. [3]

(ii) Write down a suitable domain for f for which f^{-1} exists. [1]

(b) Functions g and h are defined by

$$g(x) = 4e^x - 2 \text{ for } x \in \mathbb{R},$$
$$h(x) = \ln 5x \text{ for } x > 0.$$

(i) Find $g^{-1}(x)$. [2]

(ii) Solve $gh(x) = 18$. [3]

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Oct/Nov 2013 (13)

5.

For $x \in \mathbb{R}$, the functions f and g are defined by

$$f(x) = 2x^3,$$

$$g(x) = 4x - 5x^2.$$

(i) Express $f^2\left(\frac{1}{2}\right)$ as a power of 2. [2]

(ii) Find the values of x for which f and g are increasing at the same rate with respect to x. [4]

May/June 2015 (11)

8.

It is given that $\quad f(x) = 3e^{2x} \quad$ for $x \geqslant 0$,

$\quad g(x) = (x+2)^2 + 5 \quad$ for $x \geqslant 0$.

(i) Write down the range of f and of g. [2]

(ii) Find g^{-1}, stating its domain. [3]

(iii) Find the exact solution of $gf(x) = 41$. [4]

(iv) Evaluate $f'(\ln 4)$. [2]

Oct/Nov 2015 (11)

11.

(a) A function f is such that $f(x) = x^2 + 6x + 4$ for $x \geqslant 0$.

(i) Show that $x^2 + 6x + 4$ can be written in the form $(x + a)^2 + b$, where a and b are integers. [2]

(ii) Write down the range of f. [1]

(iii) Find f^{-1} and state its domain. [3]

(b) Functions g and h are such that, for $x \in \mathbb{R}$,

$$g(x) = e^x \quad \text{and} \quad h(x) = 5x + 2.$$

Solve $h^2g(x) = 37$. [4]

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May/June 2016 (11)

6.

The function f is defined by $f(x) = 2 - \sqrt{x+5}$ for $-5 \leqslant x < 0$.

(i) Write down the range of f. [2]

(ii) Find $f^{-1}(x)$ and state its domain and range. [4]

The function g is defined by $g(x) = \frac{4}{x}$ for $-5 \leqslant x < -1$.

(iii) Solve $fg(x) = 0$. [3]

May/June 2017 (11)

4.

(a) It is given that $f(x) = 3e^{-4x} + 5$ for $x \in \mathbb{R}$.

(i) State the range of f. [1]

(ii) Find f^{-1} and state its domain. [4]

(b) It is given that $g(x) = x^2 + 5$ and $h(x) = \ln x$ for $x > 0$. Solve $hg(x) = 2$. [3]

Oct/Nov 2017 (11)

6.

(a) Functions f and g are such that, for $x \in \mathbb{R}$,

$$f(x) = x^2 + 3,$$

$$g(x) = 4x - 1.$$

(i) State the range of f. [1]

(ii) Solve $fg(x) = 4$. [3]

(b) A function h is such that $h(x) = \frac{2x+1}{x-4}$ for $x \in \mathbb{R}$, $x \neq 4$.

(i) Find $h^{-1}(x)$ and state its range. [4]

(ii) Find $h^2(x)$, giving your answer in its simplest form. [3]

Oct/Nov 2017 (12)

6.

Functions f and g are defined, for $x > 0$, by

$$f(x) = \ln x,$$
$$g(x) = 2x^2 + 3.$$

(i) Write down the range of f. [1]

(ii) Write down the range of g. [1]

(iii) Find the exact value of $f^{-1}g(4)$. [2]

(iv) Find $g^{-1}(x)$ and state its domain. [3]