# Year 2 Pure Chapter 2: Functions - Exam Questions (Total Marks 38)

**1.** The function f is defined by

$$f : x \mapsto 2x - 5 \qquad x \in \mathbb{R}$$

The function g is defined by

$$g : x \mapsto x^2 - 4x + 1, \quad x \in \mathbb{R}, \quad 0 \le x \le 5$$

(a) Find fg(2).

**(2)**

(b) Find the range of g.

**(3)**

**(Total 5 marks)**

**2.** The function f is defined by

$$f: x \mapsto 2x - 5, \quad x \in \mathbb{R}.$$

The function g is defined by

$$g: x \mapsto x(x - 6), \quad x \in \mathbb{R}.$$

(a) Find the range of g(x).

**(3)**

(b) Find fg(1).

**(2)**

**(Total 5 marks)**

**3.** The functions f and g are defined by

$$\text{f}: x \mapsto 2x, \qquad x \in \mathbb{R},$$

$$\text{g}: x \mapsto 4x + a, \qquad x \in \mathbb{R}.$$

(a)    Find an expression for fg($x$).

(2)

(b)    Solve, for $x$ in terms of $a$, the equation

fg($x$) = 3$a$.

(3)

**(Total 5 marks)**

**4.** The function f is defined by

$$f: \ x \mapsto 2x, \quad x \in \mathbb{R}.$$

(a) Find $f^{-1}(x)$ and state the domain of $f^{-1}$.

(2)

The function g is defined by

$$g: \ x \mapsto 3x^2 + 2, \quad x \in \mathbb{R}.$$

(b) Find $gf^{-1}(x)$.

(2)

(c) State the range of $gf^{-1}(x)$.

(1)

**(Total 5 marks)**

**5.** The function f is given by

$$f : x \mapsto 2 + \frac{3}{x + 2}, \quad x \in \mathbb{R}, \quad x \neq -2.$$

(a) Express $2 + \dfrac{3}{x + 2}$ as a single fraction.

**(1)**

(b) Find an expression for $f^{-1}(x)$.

**(3)**
**(Total 4 marks)**

**6.** The functions f and g are defined by

$$f: x \mapsto x^2 - 2x + 3, \quad x \in \mathbb{R}, \quad 0 \leq x \leq 4,$$

$$g: x \mapsto \lambda x + 1, \text{ where } \lambda \text{ is a constant}, x \in \mathbb{R}.$$

(a)    Find the range of f.

(3)

(b)    Given that $gf(2) = 16$, find the value of $\lambda$.

(3)

**(Total 6 marks)**

**7.** The functions f and g are defined by

$$f : x \mapsto 1 - 2x^3, \qquad x \in \Re$$
$$g : x \mapsto \frac{3}{x} - 4, \ x > 0 \quad x \in \Re$$

(a) Find the inverse function $f^{-1}$.

(2)

(b) Show that the composite function gf is

$$gf : x \mapsto \frac{8x^3 - 1}{1 - 2x^3}$$

(4)

(c) Solve $gf(x) = 0$.

(2)

**(Total 8 marks)**