

## Higher Mathematics

### Composite Functions - Questions - 2013-2019

Marks are indicated in brackets after each question number

#### 2013 Paper 1 Question 1, (2)

The functions  $f$  and  $g$  are defined by  $f(x) = x^2 + 1$  and  $g(x) = 3x - 4$ , on the set of real numbers.

Find  $g(f(x))$ .

#### 2014 Paper 2 Question 3, (2)

Functions  $f$  and  $g$  are defined on suitable domains by

$$f(x) = x(x - 1) + q \text{ and } g(x) = x + 3.$$

(a) Find an expression for  $f(g(x))$ .

(b) Hence, find the value of  $q$  such that the equation  $f(g(x)) = 0$  has equal roots.

#### 2015 Paper 1 Question 5, (2) (1)

A function  $g$  is defined on  $\mathbb{R}$ , the set of real numbers, by  $g(x) = 6 - 2x$ .

(a) Determine an expression for  $g^{-1}(x)$ .

(b) Write down an expression for  $g(g^{-1}(x))$ .

2015 Paper 2 Question 2, (2) (3) (2)

Functions  $f$  and  $g$  are defined on suitable domains by

$$f(x) = 10 + x \quad \text{and} \quad g(x) = (1 + x)(3 - x) + 2.$$

- (a) Find an expression for  $f(g(x))$ .
- (b) Express  $f(g(x))$  in the form  $p(x + q)^2 + r$ .
- (c) Another function  $h$  is given by  $h(x) = \frac{1}{f(g(x))}$ .

What values of  $x$  cannot be in the domain of  $h$ ?

2016 Paper 1 Question 12, (2) (3)

The functions  $f$  and  $g$  are defined on  $\mathbb{R}$ , the set of real numbers by

$$f(x) = 2x^2 - 4x + 5 \quad \text{and} \quad g(x) = 3 - x.$$

- (a) Given  $h(x) = f(g(x))$ , show that  $h(x) = 2x^2 - 8x + 11$ .
- (b) Express  $h(x)$  in the form  $p(x + q)^2 + r$ .

2017 Paper 1 Question 1, (1) (2)

Functions  $f$  and  $g$  are defined on suitable domains by  $f(x) = 5x$  and  $g(x) = 2 \cos x$ .

- (a) Evaluate  $f(g(0))$ .
- (b) Find an expression for  $g(f(x))$ .

2018 Paper 2 Question 6, (2) (1)

Functions,  $f$  and  $g$ , are given by  $f(x) = 3 + \cos x$  and  $g(x) = 2x$ ,  $x \in \mathbb{R}$ .

(a) Find expressions for

(i)  $f(g(x))$  and

(ii)  $g(f(x))$ .

2019 Paper 1 Question 12, (2) (1)

Functions  $f$  and  $g$  are defined by

•  $f(x) = \frac{1}{\sqrt{x}}$ , where  $x > 0$

•  $g(x) = 5 - x$ , where  $x \in \mathbb{R}$ .

(a) Determine an expression for  $f(g(x))$ .

(b) State the range of values of  $x$  for which  $f(g(x))$  is undefined.