

**UNIT 30** *Functions***CSEC Revision Test**

1. The function  $f : x \rightarrow \frac{1}{2}x - 1$ .
- (a) Find the value of  $f(0)$ .
- (b) Find the value of  $x$  for which  $f(x) = -5$ . (3 marks)
- (CXC)
2. Given  $f(x) = 4 - 5x$  and  $g(x) = x^2 + 1$ , calculate
- (a)  $f(-2)$  (1 mark)
- (b)  $gf(-1)$  (2 marks)
- (c)  $f^{-1}(4)$  (3 marks)
- (CXC)
3. What is the inverse function when  $f(x) = k$  ( $k$  constant,  $k \neq 0$ ) (2 marks)
4. If  $f(x) = 2x - 3$ , find the values of
- (a)  $f(2)$  (1 mark)
- (b)  $f^{-1}(0)$  (2 marks)
- (c)  $f^{-1}(2)$  (2 marks)
- (CXC)
5.  $f : x \rightarrow \frac{1}{5-x} + 2$
- (a) Determine
- (i)  $f(4)$       (ii)  $f(0)$       (iii)  $f(-3)$  (3 marks)
- (b) Write down the value of
- (i)  $f^{-1}(3)$       (ii)  $f^{-1}\left(2\frac{1}{5}\right)$  (2 marks)
- (c) Find  $f^{-1}(x)$  and verify your answer to part (b), (i) and (ii). (4 marks)
- (d) Show that  $f^{-1}f(x) = x$ . (3 marks)

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6. The functions,  $f$  and  $g$ , are defined by

$$f(x) = \frac{x}{3} + 1 \text{ and}$$

$$g(x) = 2x - 1.$$

(a) Calculate  $g(-3)$ . (1 mark)

(b) Find, in its simplest form,

(i)  $f^{-1}(x)$

(ii)  $g^{-1}(x)$

(iii)  $fg(x)$

(iv)  $(fg)^{-1}(x)$  (8 marks)

(c) Show that  $(fg)^{-1}(x) = g^{-1}f^{-1}(x)$ . (3 marks)  
(CXC)

**TOTAL MARKS: 40**

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1. (a)  $f(0) = -1$  B1  
 (b)  $-5 = \frac{1}{2}x - 1 \Rightarrow x = -8$  M1 A1 (3 marks)
2. (a)  $f(-2) = 14$  B1  
 (b)  $gf(-1) = g(9) = 82$  M1 A1  
 (c)  $4 = 4 - 5x \Rightarrow 5x = 0 \Rightarrow x = 0$  i.e.  $f^{-1}(4) = 0$  M1 A1 A1 (6 marks)
3. (a)  $y = kx \Rightarrow x = \frac{1}{k}y \Rightarrow f^{-1}(x) = \frac{1}{k}x$  M1 A1 (2 marks)
4. (a) 1 B1  
 (b)  $0 = 2x - 3 \Rightarrow x = \frac{3}{2}$  M1 A1  
 (c)  $f^{-1}f(2) = f^{-1}(1) = 2$  M1 A1 (5 marks)
5. (a) (i) 3 (ii)  $2\frac{1}{5}$  (iii)  $2\frac{1}{8}$  B1 B1 B1  
 (b) (i) 4 (ii) 0 B1 B1  
 (c)  $y = \frac{1}{5-x} + 2 \Rightarrow 5 - x = \frac{1}{y-2} \Rightarrow x = 5 - \frac{1}{y-2}$   
 $\Rightarrow f^{-1}(x) = 5 - \frac{1}{(x-2)}$  M1 A1  
 and  $f^{-1}(3) = 5 - 1 = 4$  and  $f^{-1}\left(2\frac{1}{5}\right) = 0$  B1 B1  
 (d)  $f^{-1}f(x) = f^{-1}(f(x)) = 5 - \frac{1}{f(x)-2}$   
 $= 5 - \frac{1}{\left(\frac{1}{(5-x)}\right)} = 5 - (5-x) = x$  M1 A1 A1 (12 marks)

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6. (a)  $g(-3) = -7$  B1
- (b) (i)  $y = \frac{x}{3} + 1 \Rightarrow x = 3(y - 1) \Rightarrow f^{-1}(x) = 3(x - 1)$  M1 A1
- (ii)  $y = 2x - 1 \Rightarrow x = \frac{1}{2}(y + 1) \Rightarrow g^{-1}(x) = \frac{1}{2}(x + 1)$  M1 A1
- (iii)  $fg(x) = f(2x - 1) = \frac{(2x - 1)}{3} + 1 = \frac{2x + 2}{3} = \frac{2}{3}(x + 1)$  M1 A1
- (iv)  $y = \frac{2}{3}(x + 1) \Rightarrow x = \frac{3}{2}y - 1 \Rightarrow (fg)^{-1}(x) = \frac{3}{2}x - 1$  M1 A1
- (c)  $g^{-1}f^{-1}(x) = g^{-1}(f^{-1}(x)) = \frac{1}{2}(3(x - 1) + 1) = \frac{3}{2}x - 1$   
 $= (fg)^{-1}(x)$  M1 A1 A1 (12 marks)

**TOTAL MARKS: 40**