**Lesson 11**

### 11.1 Homework

Marks Available: 60

### Question 1

The function $f$ is given by, $f(x) = x^2 + 3$ $\qquad x \in \mathbb{R}$

Calculate;

**( i )** $\quad f(4)$ $\qquad\qquad\qquad$ **( ii )** $\quad f(9)$

**( iii )** $\quad f(1)$ $\qquad\qquad\qquad$ **( iv )** $\quad f(0)$

**( v )** $\quad f(6)$ $\qquad\qquad\qquad$ **( vi )** $\quad f(-6)$

**( vii )** $\quad f(100)$ $\qquad\qquad\qquad$ **( viii )** $\quad f\left(\dfrac{1}{2}\right)$

**( ix )** $\quad f\left(\dfrac{3}{2}\right)$ $\qquad\qquad\qquad$ **( x )** $\quad f\left(\sqrt{5}\right)$

**[ 6 marks ]**

### Question 2

Sometimes the domain of a function is restricted.

Consider the function, $g(x) = \dfrac{12}{x+2}, \quad x \in \mathbb{R}, \quad x \neq -2$

**( i )** $\quad$ What number is not allowed into this function ?

**[ 1 mark ]**

**( ii )** $\quad$ Why is this function's domain restricted in this way ?

**[ 2 marks ]**

**Question 3**

This question involves the functions;

$$f(x) = 5x - 3 \qquad x \in \mathbb{R}$$

$$g(x) = \frac{12}{x + 2} \qquad x \in \mathbb{R}, \quad x \neq -2$$

Determine the value of,

(**i**)  $f(8)$                        (**ii**)  $g(1)$

(**iii**)  $ff(3)$                       (**iv**)  $fg(4)$

(**v**)  $gf(1)$

**[ 5 marks ]**

**Question 4**

If $H(x) = 4x^2 - 1, \quad x \in R$ find expressions that do not involve brackets for,

(**i**)  $H(7)$                        (**ii**)  $H(10x)$

(**iii**)  $H(x + 3)$        **HINT :** FOIL

**[ 1, 2, 3 marks ]**

**Question 5**

If $w(x) = 8x + 7$ find $x$ such that $w(x) = 31$ $\qquad$ $(x \in \mathbb{R})$

**[ 3 marks ]**

**Question 6**

If $n(x) = \dfrac{2x + 5}{3}$ find $x$ such that $n(x) = 13$ $\qquad$ $(x \in \mathbb{R})$

**[ 3 marks ]**

**Question 7**

Let $u$ and $v$ be the functions;

$$u(x) = 7x + 4 \qquad x \in \mathbb{R}$$
$$v(x) = 6x + 5 \qquad x \in \mathbb{R}$$
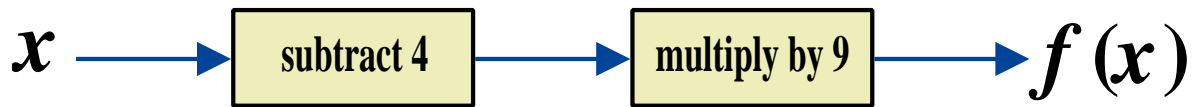
Evaluate each of the following;

( **i** ) $\quad u\,v\,(1)$ $\qquad\qquad$ ( **ii** ) $\quad u\,v\,(-1)$

( **iii** ) $\quad u\,v\,(3z)$ $\qquad\qquad$ ( **iv** ) $\quad u\,v\,(4z + 1)$

**[ 1, 1, 2, 2 marks ]**

**Question 8**
Consider the following flow diagram;

$$x \longrightarrow \boxed{\text{subtract 4}} \longrightarrow \boxed{\text{multiply by 9}} \longrightarrow f(x)$$

( **a** )    Write down        ( **i** )      $f(x)$

                    ( **ii** )      $f^{-1}(x)$

**[ 1, 2 marks ]**

( **b** )    Determine the value of,

    ( **i** )    $f(8)$                 ( **ii** )    $f^{-1}(45)$

**[ 1, 1 marks ]**

**Question 9**
( **a** )    Fill in the flow diagram for the function

$$L(x) \; = \; 7(x - 8) \qquad x \in \mathbb{R}$$

$$x \longrightarrow \boxed{\phantom{xxxxxx}} \longrightarrow \boxed{\phantom{xxxxxx}} \longrightarrow L(x)$$
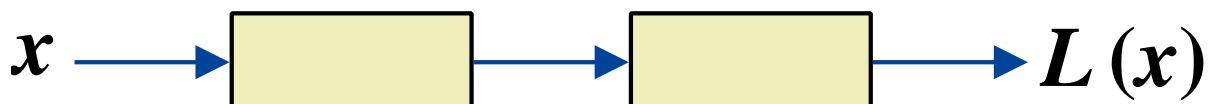
**[ 1 mark ]**

( **b** )    Write down  $L^{-1}(x)$

**[ 2 marks ]**

( **c** )    Determine the value of,

    ( **i** )    $L(17)$                 ( **ii** )    $L^{-1}(35)$

**[ 1, 1 marks ]**

**Question 10**

Consider the function $k(x) = \dfrac{x}{7} - 3, \quad x \in \mathbb{R}$

Find an expression for the inverse function $k^{-1}(x)$

**HINT :** Draw a flow diagram.

**[ 4 marks ]**

The GCSE examination often includes an awkward functions question.
Here is an example of a grade 8 question.
**Question 11**

For the function $f(x) = 4x - 1, \quad x \in \mathbb{R}$ determine $x$ such that $f(x) = f^{-1}(x)$

**[ 5 marks ]**

**Question 12**

Consider the function, $f(x) = \dfrac{13}{5x} + 4, \quad x \in \mathbb{R}, \ x \neq 0$

Find an expression for the inverse function $f^{-1}(x)$

**[ 4 marks ]**

**Question 13**

Consider the function, $f(x) = \dfrac{x + 11}{x - 2}, \quad x \in \mathbb{R}, \ x \neq 2$

Find an expression for the inverse function $f^{-1}(x)$

**[ 5 marks ]**