CHAPTER FIVE

FUNCTIONS AND ITS ASSOCIATED SIMPLIFICATION

Simplification:

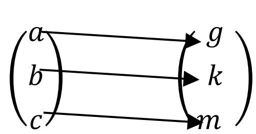
- Let x and y be two sets. When each number of the set x is associated or related to only one member of the set *y*, then such a relation is known as a function from x to y.
- This is written as f: x $\rightarrow$ *y* and read as "the function from the set x to the set y or by the equation y = f(x).
- The set x is known as the domain and the set y is known as the co-domain or the images.
- The word function emphasizes the idea of the dependence of one quality on another. For example, let f be the mapping which is defined by f: $x \rightarrow 2x+1$, which can be written as y = $2x + 1$. We say that y is a function of x which means that y depends on x
- The variable x is called the independent variable, and y is called the dependent variable. The type of relation between x and y is called a functional relation. Each of the following defines the same set.

1) F: $\{x \rightarrow 2x - 1, x \in N\}$.
2) F = $\{(x,y): y = 2x - 1, x \in N\}$.
3) F = $\{x, 2x - 1: x \in N\}$.
4) Y = $2x - 1$, $x \in N$.
5) F(x) = $2x - 1$, $x \in N$.

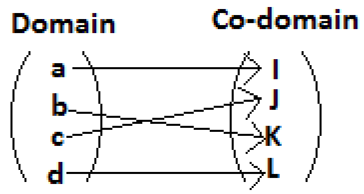
A function (or mapping) is therefore the relation between the elements of two sets, which are the domain and the co-domain, such that each element within the domain is associated or related to only one element in the co-domain.

Example (1)

Domain   Co-domain



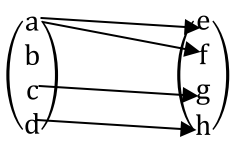
Example (2)



This is also a function, since each member of the mdomain is associated with only one member of the co-domain.

Example (3)

Domain Co-domain



This is not a function, for the first member of the domain i.e a, is associated with two members of the co-domain.

(Q1.) Given that F(x) = 2x+1, evaluated the following:

f(2) (b.) f(4) (c.) f(-3)

(d) f(-1) (e.) 2f(x) (f.) 5f(x).

<u>Soln.</u>

F(x) = 2x+1 =>

a.F(2) = 2(2)+1 = 4+1 = 5.

b. F(4) = 2(4)+1 = 8+1 = 9.

c. F(-3) = 2(-3)+1 = -6+1 = -5.

d. F(-1) = 2(-1)+1 = -2+1 = -1.

e. Since f(x) = (2x+1) $\Rightarrow$ 2f(x) = 2(2x+1) = 4x+2.

f. $5f(x) = 5(2x+1) = 10x + 5$.

N/B: $F(x) = 2x + 1$ can be written as $F(x) = (2x + 1)$ or $F(x) = 1(2x+1)$.

(Q2.) If $g(x) = 3x – 1$, evaluate the following:

a.$g(-1)$ b.) $g(-2)$ c.) $g(^1/_2)$

d.) $3g(x) +1$ e.) $4 g(x) – 2$

f.) $-2g(x)+2$ g.) $-3g(x) -3$.

<u>Soln.</u>

$g(x) = 3x – 1 =>$

a.$g(-1) = 3(-1) -1 = -3 – 1 = -4$.

b. $g(-2) = 3(-2) -1 = - 6 – 1 = -7$.

c. $g(^1/_2) = 3(^1/_2) -1 = 3 \times {^1/_2} – 1 = 1.5 – 1 = 0.5$.

d. $g(x) = 3x – 1 => 3g(x) + 1 = 3(3x-1) + 1 = 9x – 3 +1 = 9x – 2$.

e. $g(x) = 3x – 1 => 4 g(x) -2 = 4(3x - 1) -2 = (12x - 4) -2 = 12x - 4 - 2 = 12x – 6$.

f. $g(x) = 3x – 1 => -2 g(x) + 2 = -2(3x-1) + 2 = (- 6x+2) +2 = - 6x+2+2 = - 6x+4$.

g. $g(x) = 3x – 1 => -3g(x) -3 = -3(3x – 1) -3 = (-9x +3) -3 = -9x+3 -3 = -9x$.

Q3. Given that $f(x) = 2x + 1$ and $g(x) = 4x +2$, evaluate the following:

a. $g(x) +f(x)$ b. $2g(x) +f(x)$ c. $3g(x) + 4f(x)$

d. $½ g(x) + 2f(x)$ e. $g(x) – f(x)$ f. $3g(x) – 2(fx)$

<u>soln.</u>

$g(x) = 4x+2$ and $F(x) = 2x+1 =>$

a.) $g(x) + f(x) = (4x+2) + (2x+1) = 6x+3$.

b.) $2g(x) + f(x) = 2(4x+2) + (2x+1) = 8x+4+2x+1 = 8x+2x+4+1 = 10x +5$

c.) $3g(x) + 4f(x) = 3(4x+2) + 4(2x+1) = (12x+6) + (8x+4) = 12x +6+8x + 4 = 12x+8x+6+4 = 20x+10$.

d.) $\frac{1}{2} g(x) +2f(x) = {}^{1}/_{2}(4x+2) +2 (2x+1) = \frac{1}{2} \times 4x+1/2 \times 2 +4x +2 = 2x+1+4x+2 = 2x + 4x + 1+2 = 6x +3$.

e.) $g(x) – f(x)$

$= (4x +2) – (2x + 1) = 4x+2 – 2x – 1$,

$= 4x – 2x + 2 – 1 = 2x +1$.

f.) $3g(x) – 2f(x)$

$= 3(4x + 2) -2(2x +1)$,

$= 12x + 6 - 4x – 2 = 12x – 4x + 6 – 2$

$= 8x + 4$.

Q4. Given that $f(x) = -2x – 1$ and $g(x) = 3x – 2$, evaluate the following: (i) $f(x) + g(x)$(ii) $2f(x) + 4g(x)$

(iii) $-2f(x) – g(x)$ (iv) $-3f(x) + 2g(x)$

(v) $-2f(x) – 3g(x)$

Soln.

$F(x) = -2x – 1$ and $g(x) = 3x – 2$ =>

(i) $f(x)+ g(x) = (-2x – 1) + (3x – 2)$

$= -2x – 1 + 3x – 2 = -2x + 3x – 1 – 2$

$= x – 3$.

(ii) $2f(x) + 4g(x) = 2(-2x – 1) + 4(3x – 2)$

$= -4x – 2 + 12x –8 = -4x + 12x – 2 – 8$

$= 8x – 10$.

(iii) $-2f(x) – g(x) = -2(-2x – 1) - (3x – 2) = 4x + 2 – 3x + 2 = 4x – 3x + 2 + 2$

= x + 4

(iv) -3f(x) + 2g(x) = -3(-2x – 1) + 2(3x – 2) = 6x + 3 + 6x – 4.

= 6x + 6x + 3 – 4 = 12x – 1.

(v) -2f(x) – 3g(x) = -2(-2x – 1) – 3(3x – 2)

= 4x + 2 – 9x + 6 = 4x – 9x + 2 + 6

= -5x + 8.

Q5. Given that f(x) = 3x + 2 and g(x) = -4x – 2, evaluate the following.

a.) (i) f(-1) (ii) f(-2)

b.) (i) g(-1) (ii) g(-2) (iii) g(2)

c.) (i) f(x) + g(x) (ii) f(x) – g(x)

d.) (i) 2f(x) + 3 e.) 3f(x) – 2

f.) g(x) – f(x)

Soln.

a.) f(x) = 3x + 2 =>

(i) f(1) = 3(1) + 2 = 3 + 2 = 5.

(ii) f(-2) = 3(-2) + 2 = -6 + 2 = -4.

b.) g(x) = -4x – 2 =>

(i) g(-1) = -4(-1) – 2 = 4 – 2 = 2.

(ii) g(-2) = -4(-2) - 2= 8 – 2 = 6.

(iii) g(2) = - 4(2) – 2 = -8 – 2 = -10.

c.) (i) f(x) + g(x) = (3x + 2) + (- 4x – 2)

= 3x + 2 – 4x – 2 = 3x – 4x + 2 – 2

= -x + 0 = -x

(ii) $f(x) – g(x) = (3x + 2) – (- 4x – 2)$

$= 3x + 2 + 4x + 2 = 3x + 4x + 2 + 2$

$= 7x + 4.$

d.) $2f(x) + 3 = 2(3x + 2) + 3$

$= 6x + 4 + 3 = 6x + 7.$

e.) $3f(x) – 2 = 3(3x + 2) – 2 = 9x + 6 – 2$

$= 9x + 4.$

f.) $g(x) – f(x) = (-4x – 2) – (3x + 2)$

$= - 4x – 2 – 3x – 2 = - 4x – 3x – 2 – 2$

$= -7x – 4.$

Q6. If $f(x) = 2x + 1$, evaluate.

a. $f(x + 1)$ b. $f(2x + 3)$

c. $f(2x-1)$ d. $f(3x-2)$

<u>Soln.</u>

a. $f(x) = 2x+1$, => $f(x+1)$

$= 2(x+1) +1 = (2x+2) + 1 = 2x + 2 + 1 = 2x + 3.$

b. $f(x) = 2x+1$ => $f(2x+3) = 2(2x+3) + 1 = (4x + 6) +1$

$= 4x + 6 + 1 = 4x + 7.$

c. $f(x) = 2x+1$ => $f(2x – 1) = 2(2x – 1) + 1 = (4x – 2) + 1$

$= 4x – 2+1 = 4x – 1.$

d. $f(x) = 2x+1$ => $f(3x – 2) = 2(3x – 2)+1 = (6x – 4) + 1$

$= 6x – 4 + 1 = 6x – 3$.

Q7. Given that $g(x) = x – 2$, evaluate the following: a. $g(3x+1)$ b. $g(-2x+1)$

c. $g(-4x - 3)$ d. $g(2x - 1)$

Soln.

a. $g(x) = x - 2 \Rightarrow g(3x+1) = (3x+1) - 2 = 3x+1 - 2$

$= 3x - 1.$

b. $g(x) = x- 2 \Rightarrow g(-2x+1)$

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

c. $g(x) = x - 2 \Rightarrow g(-4x - 3) = (-4x - 3) -2 = (-4x - 3) - 2$

$= -4x - 3 - 2 = -4x - 5.$

d. $g(x) = x - 2 \Rightarrow g(2x - 1) = (2x - 1) - 2 = 2x - 3.$

Q8. A function $f: x \rightarrow 3x+2$, is defined on the set x

$= \{-3,-2,-1, 0, 1, 2, 3, 4, 5, 6\}.$

a. Find the images of the following:

i. -3 ii. -1 iii. 2 iv. 5

b. Find the value of x for which

i. $F(x) = 8$ ii. $F(x) =11$ iii. $F(x) = -4$

Soln.

a) i. $F:x\rightarrow 3x+2$ and for the image of -3, put $x = -3 \Rightarrow f(x) = 3x+2 \Rightarrow f(x) = 3(-3) +2 = -9+2 = -7.$

ii. For the image of -1, put $x = -1$. From $f(x) \rightarrow 3x+2 \Rightarrow f(x) = 3 (-1)+2 = -3+2 = -1.$

iii. For the image of 2, put $x = 2$. From $f(x) = 3x+2 \Rightarrow f(x) =3(2) +2 \Rightarrow f(x) = 6+2 = 8.$

iv. For the image of 5 put $x =5$.$F(x) = 3x+2 = 3(5) +2 = 15+2 = 17.$

b) i. F(x) =3x+2. If f(x) = 8 => 8 =3x+2 => 8 – 2 = 3x, => 6 = 3x => 3x = 6, => x = $^6/_2$ => x = 3.

ii. F(x) = 3x+2 and if f(x) = 11 => 11 = 3x+2, =>11 – 2 = 3x

⇒ 9 = 3x, => 3x = 9 => x = 9/3, => x = 3.

iii. F(x) = 3x+2 and if f(x) = - 4 => - 4 = 3x + 2, => - 4 -2 = 3x => 3x = - 6, => x = $^{-6}/_3$ => x = -2.

Q9. A function f: x → 8x+1 is defined on the set x

= {-1, 0, 2, 3, 4, 5}

a. Find the images of -1 and 3.

b. Find the value of x for which f(x) = 7.

Soln.

F(x) = 8x+1.

a. For the image of -1, put x = -1 => f(x) = 8(-1) +1 = - 8+1 = -7.

For the image of 3, put x = 3 ⇒f(x) = 8(3) +1 = 24+1 = 25.

b. F(x) = 8x+1. If f(x) = 7 => 7 = 8x+1 => 7-1 = 8x, ⇒ 6 = 8x => 8x = 6, => x = $^6/_8$ = 0.75.

Q10. A function f(x) = $\frac{5x-2}{2x+1}$ is defined on the set of real numbers.

a. Determine the images of the following:

i. -2 ii. -1 iii. 2 iv. 4

b. Evaluate the following:

i. f(3) ii.f(6)

c. Find the value of x for which f(x) is undefined.

Soln.

a. $f(x) = \frac{5x - 2}{2x + 1}$

i. For the image of -2, put x = -2 => $f(x) = \frac{5(-2) - 2}{2(-2) + 1}$

$= \frac{-10 - 2}{-4+1}$

$= \frac{-12}{-3} = 4$

ii. For the image of -1, put x = -1 =>$f(x) = \frac{5(-1) - 2}{2(-1) + 1}$

$= \frac{-5 - 2}{-2 + 1} = \frac{-7}{-1} = 7.$

iii. For the image of 2, put x = 2 => $f(x) = \frac{5(2) - 2}{2(2) + 1}$

$= \frac{10 - 2}{4 + 1}$

$= {}^{8}/_{5} = 1.6$

b. i. $f(x) = \frac{5x - 2}{2x + 1}$ => $f(3) = \frac{5(3) - 2}{2(3) + 1}$

$= \frac{15 - 2}{6 + 1} = \frac{13}{7} = 1.8.$

ii. $f(x) = \frac{5x - 2}{2x + 1}$, => $f(6) = \frac{5(6) - 2}{2(6) + 1}$

$= \frac{30 - 2}{12 + 1} = \frac{28}{13} = 2.1.$

C For the value of x for which the function is undefined, put the down part to be equal to zero and solve for x.

i.e. 2x + 1 = 0 => 2x = 0 – 1,

$\Rightarrow 2x = -1 \Rightarrow x = \frac{-1}{2} = -0.5.$

$\therefore$ The function is undefined when x = - 0.5.

Q11. A function $f(x) = \frac{3x+8}{x-1}$ is defined on the set of real numbers.
.

a. Find the image of -1 and 2.

b. Evaluate f(4).

c. Determine the value of x for which f(x) is undefined.

Soln.

a) $f(x) = \frac{3x + 8}{x - 1}$. For the image of -1, put x = -1

$\Rightarrow f(x) = \frac{3(-1) + 8}{-1 - 1}$

$= \frac{-3 + 8}{-2} = \frac{5}{-2} = -2.5.$

For the image of 2, put x = 2 $\Rightarrow f(x) = \frac{3(2) + 8}{2 - 1} = \frac{6 + 8}{1}$

= 14.

b. $f(x) = \frac{3x + 8}{x - 1} \Rightarrow f(4) = \frac{3(4) + 8}{4 - 1}$

$= \frac{12 + 8}{4 - 1} = \frac{20}{3}$

= 6.7.

c. Put x – 1 = 0 => x = 0 + 1, => x = 1 => the value of x for which f(x) is undefined is 1.

Q12. If g(x) = 2x – 1 and f(x) = 3x + 2, evaluate

a. g(1) + g(2)

b. g(1) + f(2)

c. f(-2) + g(3)

Soln.

a. $g(x) = 2x - 1 \rightarrow g(1) = 2(1) - 1 = 2 - 1 = 1$.

$g(2) = 2(2) - 1 = 4 - 1 = 3$.

$\therefore g(1) + g(2) = 1 + 3 = 4$.

b. $g(1) = 1$. $f(x) = 3x + 2 \Rightarrow f(2) = 3(2) + 2 = 6 + 2 = 8$.

$\therefore g(1) + f(2) = 1 + 8 = 9$.

b) $f(x) = 3x + 2 \Rightarrow f(-2) = 3(-2) + 2 = -6 + 2 = -4$.

$g(x) = 2x - 1 \Rightarrow g(3) = 2(3) - 1 = 6 - 1 = 5$.

Therefore $f(-2) + g(3) = -4 + 5 = 1$.

Q13. The function f is defined as $f:(x) \rightarrow 3x^2 - 5x$.

i. Evaluate f(-3).

ii. Find the value of x for which $f(x) = {}^{-4}/_{3}$.

Soln.

i. $f : x \rightarrow 3x^2 - 5x \Rightarrow f(x) = 3x^2 - 5x$,

$\therefore f(-3) = 3(-3)^2 - 5(-3)$

$= 3(9) + 15 = 27 + 15 = 42$.

ii. $f(x) = 3x^2 - 5x$. If $f(x) = \frac{-4}{3}$ then $\frac{-4}{3} = 3x^2 - 5x$.
Multiply through using 3,

$\Rightarrow \frac{-4}{3} \times 3 = 3x^2 \times 3 - 5x \times 3$,

=> - 4 = $9x^2 - 15x$,
=> $9x^2 - 15x + 4 = 0$, which is a quadratic in x, and by comparing this with $ax^2 + bx + c = 0$
=> a = 9, b = -15 and c = 4.

To get the value of x, use the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Q14. Given f(x) = px + q, find the values of P and q, if f(2) = 4 and f(4) = 10.

Soln.

f(2) = 4, but f(x) = px + q => f(2) = p(2) + q

=>f(2) = 2p + q, but f(2) = 4

=> 4 = 2p + q

=> 2p + q = 4……………………………eqn (1)

Also f(4) = 10, but f(x) = px + q

=> f(4) = p(4) + q

=> f(4) = 4p + q

But since f(4) = 10

=> 10 = 4p + q

=> 4p + q = 10…………………………..eqn (2)

Now solve eqn (1) and eqn (2) simultaneously.
2p + q = 4………….eqn (1)

4p + q = 10………...eqn (2)

Eqn. (2) x – 1 gives us - 4p – q = -10……………...eqn (3)

Add eqn (1) and eqn (3).

i.e. 2p + q = 4
+$\underline{-4p - q = -10}$

$\underline{-2p \qquad = -6}$

$\therefore -2p = -6 \Rightarrow p = \frac{-6}{-2} = 3$

Put p = 3 into eqn (1) i.e 2p + q = 4

=> 2(3) + q = 4, => 6 + q = 4

$\therefore q = 4 - 6 = -2$.

Q15. The functions f and g are defined as $f : x \rightarrow 2 - 2x^2$ and $g : x \rightarrow \frac{1}{x-1}$

Evaluate i. $g(\frac{1}{-4})$ ii. $\underline{f(2)}$ (iii) g(3)

Soln.

i. $g(x) \rightarrow \frac{1}{x-1} \Rightarrow g(\frac{1}{-4}) = \frac{1}{\frac{-1}{4} - 1}$

$= \frac{1}{-0.25 - 1} = \frac{1}{-1.25} = -0.8$.

ii. $f(x) = 2 - x^2 \Rightarrow f(2) = 2 - 2^2$

$= 2 - 4 = -2$.

$g(x) = \frac{1}{x - 1} \Rightarrow g(3) = \frac{1}{3 - 1}$

$= \frac{1}{2} = 0.5$.

$\therefore \frac{f(2)}{g(3)} = \frac{-2}{0.5} = -4$.

Q16. Find the image of (-2, 4) under the mapping

$\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} 2y \\ y-3x \end{pmatrix}$.

Soln.

(x, y) = (-2, 4) → x = -2 and y = 4. Therefore $\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} 2y \\ y-3x \end{pmatrix}$

$\Rightarrow \begin{pmatrix} -2 \\ 4 \end{pmatrix} \rightarrow \begin{pmatrix} 2(4) \\ 4-3(-2) \end{pmatrix}, \Rightarrow \begin{pmatrix} -2 \\ 4 \end{pmatrix} \rightarrow \begin{pmatrix} 8 \\ 4-(-6) \end{pmatrix} = \begin{pmatrix} 8 \\ 4+6 \end{pmatrix},$

$\Rightarrow \begin{pmatrix} -2 \\ 4 \end{pmatrix} \rightarrow \begin{pmatrix} 8 \\ 10 \end{pmatrix}$.

=>The images of -2 and 4 are 8 and 10 respectively.

Q17. Find the images of (4, 1) under the mapping $\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} 2x-3 \\ y+2 \end{pmatrix}$.

Soln.

(4, 1) => x = 4 and y = 1 and since $\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} 2x-3 \\ y+2 \end{pmatrix}$,

=> $\begin{pmatrix} 4 \\ 1 \end{pmatrix} \rightarrow \begin{pmatrix} 2(4)-3 \\ 1+2 \end{pmatrix} = \begin{pmatrix} 8-3 \\ 3 \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$,=>$\begin{pmatrix} 4 \\ 1 \end{pmatrix} \rightarrow \begin{pmatrix} 5 \\ 3 \end{pmatrix}$

The image of 4 = 5 and that of 1 = 3.

Simplifying:

To simplify $\frac{1}{a} + \frac{2}{b}$, one must go through these step:

1. Find the L.C.M which is given by a x b = ab.

2. Divide ab using the a i.e $\frac{ab}{a} = b$.

3. Use the number above the a (ie 1) to multiply the b i.e 1 x b = b.

4. Then divide ab using the b i.e $\frac{ab}{b} = a$.

5. Use the number above the b (i.e 2) to multiply the a i.e 2 x a = 2a .

Hint

$\frac{1}{a} + \frac{2}{b}$ => $\frac{b+2a}{ab} = \frac{b+2a}{ab}$

To simplify $\frac{2}{3a} - \frac{4}{b}$

1.Find the L.C.M = 3a x b = 3ab.

2. Divide this using 3a i.e. $\frac{3ab}{3a} = b$.

3. Multiply the b with the 2 i.e b x 2 = 2b.

4. We next divide 3ab by b i.e$\frac{3ab}{b} = 3a$.

5. Use the 3a to multiply the 4 i.e 3a x 4 = 12a.

Hint.$\frac{2}{3a} + \frac{4}{b}$
$\frac{2b+12a}{3ab} = \frac{2b+12a}{3ab}$

To simplify $\frac{2}{a+b} - \frac{5}{c}$

1. Find the L.C.M which will be (a+b) x c = (a+b) c = c(a+b).

2. Divide $c(a+b)$by a + b i.e $\frac{c(a+b)}{a+b} = c.$

3.Multiply the c by the 2 i.e c x 2 = 2c.

4. Next divide c(a + b) by the c i.e $\frac{c(a+b)}{c} = a + b.$

5. Multiply a + b by the 5 i.e (a + b) x 5 = (a +b)5

= 5(a+b)

Hint.$\frac{2}{a+b} - \frac{5}{c}$
$\frac{2c-5(a+b)}{c(a+b)} = \frac{2c-5a-5b}{c(a+b)}$
.

To simplify $\frac{x+1}{2a} + \frac{3}{3x-1}$

1 Find the L.C.M which is given by 2a x (3x – 1) = 2a (3x – 1).

2. Next divide 2a (3x – 1) by 2a i.e $\frac{2a(3x-1)}{2a}$ = 3x -1.

3. Multiply 3x – 1 by x +1 i.e (3x – 1)(x + 1)

= $3x^2 + 3x - x - 1 = 3x^2 + 2x - 1$.

4. Divide 2a (3x – 1) by 3x – 1 i.e $\frac{2a(3x-1)}{3x-1} = 2a$

5. Multiply 2a by the 3 ie 2a x 3 = 6a.

Hint.$\frac{x+1}{2a} + \frac{3}{3x-1}$

$\frac{(x+1)(3x-1)+6a}{2a(3x-1)} = \frac{3x^2+3x-x-1+6a}{2a(3x-1)}$

$= \frac{3x^2+2x-1+6a}{2a(3x-1)}$

Q1. Simplify $\frac{2x}{2} + \frac{3}{x+1}$

Soln.

$$\frac{2x}{2} + \frac{3}{x+1}$$

$$\frac{2x(x+1) + 2x\ 3}{2(x+1)}$$

$$= \frac{2x^2 + 2x + 6}{2(x+1)}.$$

Q2. Simplify$\frac{3}{x-4} - \frac{4}{5}$

Soln

$.\frac{3}{x-4} - \frac{4}{5}$

$\frac{3 \text{ x } 5-4 \text{ x } (x-4)}{5(x-4)}$

$= \frac{15-4\ (x-4)}{5(x-4)} = \frac{15-4x+16}{5(x-4)}$

$= \frac{15+16-4x}{5(x-4)} = \frac{31-4x}{5(x-4)}$

Q3. Simplify $\frac{4}{(x^2-4)} - \frac{2}{3}$

Soln

$$\frac{4}{(x^2-4)} - \frac{2}{3}$$

$$\frac{3\text{ x }4-2(x^2-4)}{3(x^2-4)} = \frac{12-2x^2+8}{3(x^2-4)} = \frac{12+8-2x^2}{3(x^2-4)}$$

$$= \frac{20-2x^2}{3(x^2-4)} = \frac{-2x^2+20}{3(x^2-4)}.$$

Q4. Simplify $\frac{2}{-2} - \frac{3}{x+1}$

Soln

$$\frac{2}{-2} - \frac{3}{x+1}$$

$$\frac{2(x+1)-3\times -2}{-2(x+1)}$$

$$= \frac{2x + 2 - (-)6}{-2(x + 1)}$$

$$= \frac{2x + 2 + 6}{-2(x + 1)}$$

. . ..

QUESTIONS:

Q1. Giving that $g(x) = -3x - 1$, evaluate the following:

a. $g(-2)$ Ans: 5

b. $g(3)$ Ans: -10

c. $g(-1)$ Ans: 2

d. $g(5)$ Ans: -16

e. $2g(x)$ Ans: $-6x - 2$

f. $5g(x)$ Ans: $-15x - 5$

g. $2g(3)$ Ans: -20

h. $5g(2)$ Ans: -35

Q2. Given that $f(x) = 4x + 2$, evaluate

a. $f(-1)$ Ans: -2

b. $f(-2)$ Ans: -6

c. $f(3)$ Ans: 14

d. $2f(x)$ Ans: $8x+4$

e. $4f(x)$ Ans: $16x+8$

Q3. If $g(x) = 2x - 1$ and $f(x) = 3x+2$, evaluate

A .$g(x) + f(x)$ Ans: $5x +1$

b. $g(x) - f(x)$ Ans: $-x - 3$

c. $f(x) - g(x)$ Ans: $x +3$

d. $2g(x) + 3f(x)$ Ans: $13x+4$

e. $2g(x) - f(x)$ Ans: $x - 4$

f. $3f(x) - 2g(x)$ Ans: $5x + 8$

Q4. Given that $f(x) = 3x + 2$, evaluate the following:

a. $f(x + 1)$ Ans. $3x + 5$

b. $f(2x - 1)$ Ans. $6x - 1$

c. $f(x^2 + 1)$ Ans.$3x^2 + 5$.

d. $f(2x)$ Ans. $6x + 2$

e. $f(3x + 2)$ Ans. $9x + 8$

Q5. A function f : x → 2x – 1 is defined on the set
x = {-2, -1, 0, 2, 4, 5}.
Find the images of

a. -2 Ans. -5
b. -1 Ans. -3
c. 2 Ans. 3
d. 5 Ans. 9

Q6. Given that function f(x) = 2x – 3, evaluate

a. f(2) Ans. 1
b. f(6) Ans. 9
c. f(-2) Ans. -7
d. f(-1) Ans. -5

Q7. The function g(x) = $\frac{3x+1}{x-2}$ is defined on the set of real numbers.

a. Determine the images of the following:

i. 3 Ans. 10
ii. 1 Ans. - 4
iii. -2 Ans. 1.25
iv. -3 Ans. 1.6

b. Evaluate the following:

i. g(4) Ans. 6.5
ii g(3) Ans. 10
iii. g(-5) Ans. 2

c. Determine the value of x for which the given function is undefined.
Ans. x = 2

Q8. Simplify $\frac{2}{x+1} + \frac{3}{2}$

Ans.$\frac{3x + 7}{2(x + 1)}$

Q9. Simplify $\frac{2x}{x+1} + \frac{3}{5}$

Ans.$\frac{13x+3}{5(x+1)}$

Q10. Simplify $\frac{2x}{x} - \frac{2}{x-2}$ Ans.$\frac{2x^2-6x}{x(x-2)}$

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