

Name: Hnuj Sapkota

Class: 8th

Subject: Optional Maths

First Term Examination-2077

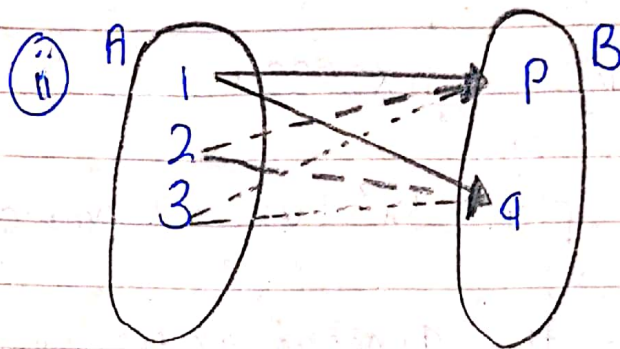
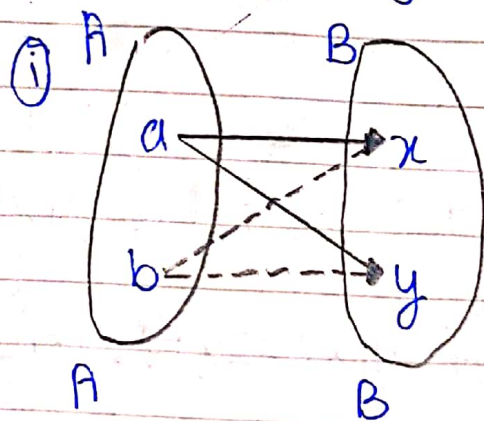
Questions

Group: A (11 × 2 = 22)

- 1) If $p(x) = 3x^3 + 4x^2 + 7$ and $q(x) = 7x^2 - 4x - 8$, find $p(x) + q(x)$
- 2) If the function g is given by $g(x) = 2x + 3$, then find the value of $\frac{g(a+x) - g(a)}{x}$.
- 3) Write the domain and range of the relation $R = \{(4, 5), (2, 3), (-5, 3), (6, 2)\}$. Also find the inverse relation of R .
- 4) If $A = \{1, 2, 3\}$ and $B = \{m, n\}$, find $A \times B$ and $B \times A$.
- 5) If $\{2, 3, 5\}$ is the domain of the relation $r = \{(x, y), y = 10 - 3x\}$, find the range of the relation.
- 6) If $p(x) = 3x^3 + 4x^2 - 6$ and $q(x) = 3x^3 + 5x^2 + 1$, find $p(x) - q(x)$.
- 7) If $f(x) = 5x + 4$, find $f(3)$ and $f(-3)$.
- 8) Are the following pairs of polynomials equal? If so, give reason with process.
$$f(x) = 2x^3 - \frac{3x^2}{2} - 4x + 6 \text{ and } g(x) = \frac{1}{2}(4x^3 - 3x^2 - 8x + 12)$$
- 9) If $(x, x+y) = (2, 7)$. Find the value of x and y .
- 10) If $\{2, 3, 5\}$ is the range of the relation $g = \{(x, y); x = 0 - 2y\}$, find the domain of the relation.

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11) From the arrow diagrams given below, find $A \times B$.



Group B ($7 \times 4 = 28$)

12) If $f(x) = 3x^3 + 4x^2 + 7$, $g(x) = 2x^3 - 3x^2 + 2$ and $h(x) = 3x^3 - x^2 - 8$ find;

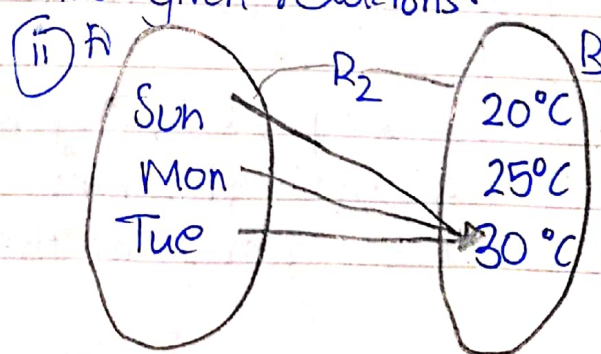
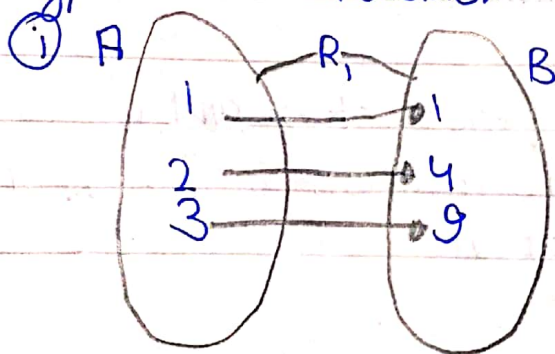
$3f(x) - g(x) + 2h(x)$ & write its degree.

13) Represent the Relation $R = \{(2, 5), (3, 6), (4, 7)\}$ in the form of i) table ii) Arrow diagram (iii) a graph.

14) Define polynomial. Write down the polynomial on the basis of;

i) no. of terms, ii) degree and iii) number of variables.

15) Define relations and write down its types. Mention the types of the relations from the given relations.



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16) A polynomial is given below:

$$f(x) = 7x^2 - 4x - 8$$

a) What is the degree of the given polynomial?

b) Identify the given polynomial by the:

i) Degree, ii) Number of terms, & iii) Number of variables.

17) Draw the diagrams for the following relations and state whether ~~they~~ each of them is function or not.

(a) $f = \{(-4, 4), (-3, 3), (-1, 3), (0, 2)\}$

(b) $h = \{(1, 2), (3, 8), (4, 2), (1, 6)\}$

18) If $A = \{1, 3, 4, 5\}$ and $B = \{1, 2, 3\}$, find the Cartesian product $A \times B$ and find the following relations.

a) x is less than y .

b) x is square of y .

c) x is greater than y .

d) x is equal to y .

Answers

Group A

1) $\rightarrow$ Soln

Here,

$$p(x) = 3x^3 + 4x^2 + 7$$

$$q(x) = 7x^2 - 4x - 8$$

$$p(x) + q(x) = 8$$

We have,

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We have,

$$\begin{aligned} p(x) + q(x) &= 3x^3 + 4x^2 + 7 + 7x^2 - 4x - 8 \\ &= 3x^3 + 7x^2 + 4x^2 - 4x - 8 + 7 \\ &= 3x^3 + 11x^2 - 4x - 1 \end{aligned}$$

$$p(x) + q(x) = 3x^3 + 11x^2 - 4x - 1$$

2) $\rightarrow$ Soln
Here,

$$g(x) = 2x + 3$$

We have,

$$\begin{aligned} g(a+x) &= g(x) = 2(a+x) + 3 \\ &= 2a + 2x + 3 \end{aligned}$$

$$\begin{aligned} g(a) &= g(x) = 2(a) + 3 \\ &= 2a + 3 \end{aligned}$$

Now,

$$\begin{aligned} \frac{g(a+x) - g(a)}{x} &= \frac{2a + 2x + 3 - (2a + 3)}{x} \\ &= \frac{2\cancel{a} + 2x + 3 - 2\cancel{a} - 3}{x} \end{aligned}$$

$$\frac{g(a+x) - g(a)}{x} = 2$$

3) $\rightarrow$ Soln
Here,

$$R = \{(4, 5), (2, 3), (-5, 3), (6, 2)\}$$

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We have,

- Domain of $R = \{4, 2, -5, 6\}$
- Range of $R = \{5, 3, 2\}$
- $R^{-1} = \{(5, 4), (3, 2), (2, -5), (6, 2)\}$

4) $\rightarrow$ Solⁿ

Here,

$$A = \{1, 2, 3\}$$

$$B = \{m, n\}$$

We have,

$$\therefore A \times B = \{(1, m), (1, n), (2, m), (2, n), (3, m), (3, n)\}$$

$$\therefore B \times A = \{(m, 1), (m, 2), (m, 3), (n, 1), (n, 2), (n, 3)\}$$

5) $\rightarrow$ Solⁿ

Here,

$$x = \{2, 3, 5\}$$

$$y = \{(x, y), y = 10 - 3x\}$$

Now,

$$\begin{aligned} \text{- When } x = 2, \quad y &= 10 - 3x \\ &= 10 - 3 \times 2 \\ &= 10 - 6 \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{- When } x = 3, \quad y &= 10 - 3x \\ &= 10 - 3 \times 3 \\ &= 10 - 9 \\ &= 1 \end{aligned}$$

$\rightarrow$

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$$\begin{aligned} \text{When } x = 5, y &= 10 - 3x \\ &= 10 - 3 \times 5 \\ &= 10 - 15 \\ &= -5 \end{aligned}$$

$\therefore y = \{4, 1, -5\}$
So, Range is $\{4, 1, -5\}$.

6 $\rightarrow$ Soln

Here,

$$p(x) = 3x^3 + 4x^2 - 6$$

$$q(x) = 3x^3 + 5x^2 + 1$$

$$p(x) - q(x) = ?$$

We have,

$$\begin{aligned} p(x) - q(x) &= 3x^3 + 4x^2 - 6 - (3x^3 + 5x^2 + 1) \\ &= 3x^3 + 4x^2 - 6 - 3x^3 - 5x^2 - 1 \\ &= -x^2 - 7 \end{aligned}$$

$$\therefore p(x) - q(x) = -x^2 - 7$$

7 $\rightarrow$ Soln

Here,

$$f(x) = 5x + 4$$

We have,

$$f(3) = f(x) = 5x(3) + 4 = 15 + 4 = 19$$

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$$\begin{aligned} -f(-3) &= f(x) = 5x(-3) + 4 \\ &= -15 + 4 \\ &= \underline{-11} \end{aligned}$$

8) $\rightarrow$ Soln,

Here,

$$f(x) = 2x^3 - \frac{3}{2}x^2 - 4x + 6$$

$$g(x) = \frac{1}{2} (4x^3 - 3x^2 - 8x + 12)$$

~~We have,~~ $= 2x^3 - \frac{3}{2}x^2 - 4x + 6$

Since, no. of terms, corresponding like terms and degree are equal.

So,

$$f(x) = g(x)$$

9) $\rightarrow$ Soln,

Here,

$$(x, x+y) = (2, 7)$$



From the above condition,

① $x = 2$

② $x+y = 7$

or, $2+y = 7$

$$7$$

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$$\begin{aligned} \text{or, } y &= 7-2 \\ \therefore y &= 5 \\ \text{So, } \therefore x &= 2 \text{ and } \therefore y = 5 \end{aligned}$$

10) $\rightarrow$ Soln,

Here,

$$\begin{aligned} y &= \{2, 3, 5\} \\ g &= \{(x, y); x = 10 - 2y\} \end{aligned}$$

We have,

$$\text{When } y = 2,$$

$$x = 10 - 2y = 10 - 2 \times 2 = 10 - 4 = 6$$

$$\text{When } y = 3,$$

$$x = 10 - 2y = 10 - 2 \times 3 = 10 - 6 = 4$$

$$\text{When } y = 5,$$

$$x = 10 - 2y = 10 - 2 \times 5 = 10 - 10 = 0$$

So,

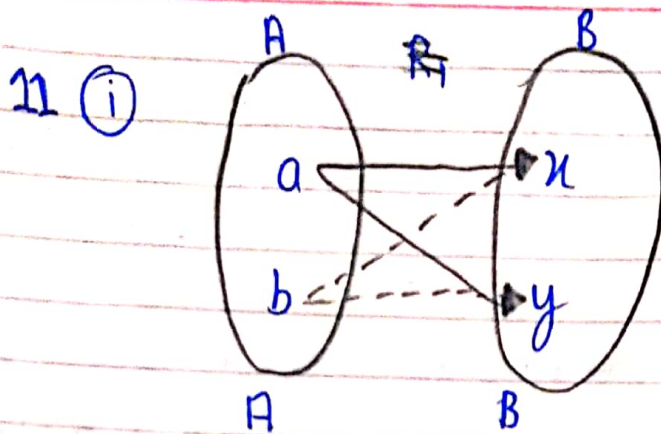
$$\therefore x = \{6, 4, 0\}$$

$\therefore$ domain of g is $\{6, 4, 0\}$

11) $\rightarrow$ (i)

$\rightarrow$

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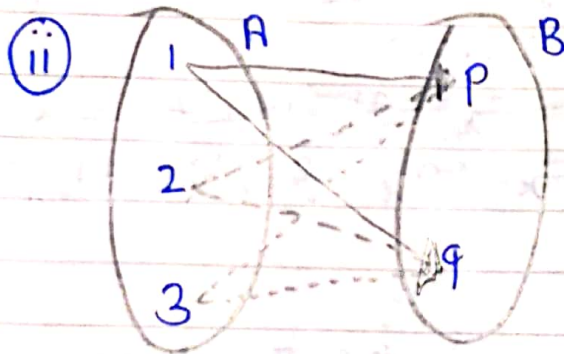


→ Soln

Here,

$$A = \{a, b\} \text{ \& } B = \{x, y\}$$

$$\text{So, } A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$$



→ Soln

Here,

$$A = \{1, 2, 3\} \text{ and } B = \{p, q\}$$

$$\text{So, } A \times B = \{(1, p), (1, q), (2, p), (2, q), (3, p), (3, q)\}$$

Group B

12) → Soln
Here,

→

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$$f(x) = 3x^3 + 4x^2 + 7$$

$$g(x) = 2x^3 - 3x^2 + 2$$

$$h(x) = 3x^3 - x^2 - 8$$

To find : $3f(x) - g(x) + 2h(x)$;

We have,

$$3f(x) - g(x) + 2h(x) = 3(3x^3 + 4x^2 + 7) - (2x^3 - 3x^2 + 2) + 2(3x^3 - x^2 - 8)$$

$$= 9x^3 + 12x^2 + 21 - 2x^3 + 3x^2 - 2 + 6x^3 - 2x^2 - 16$$

$$= 9x^3 - 2x^3 + 6x^3 + 12x^2 + 3x^2 - 2x^2 + 21 - 16 - 2$$

$$= 13x^3 + 12x^2 + 3$$

Now,

$$= 13x^3 + 12x^2 + 3$$

① The highest index is 3, $\therefore$ The degree of the polynomial is 3.

B) $\rightarrow$ Solⁿ,
Here,

$$R = \{(2,5), (3,6), (4,7)\}$$

Representing R in table form,

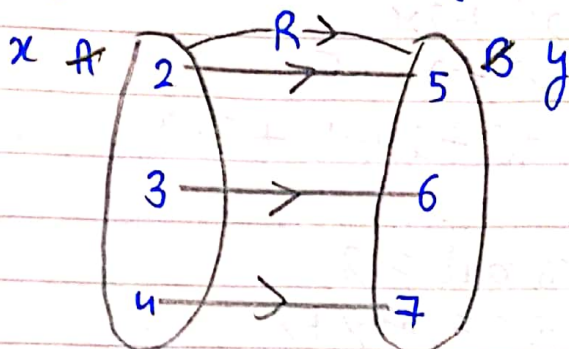
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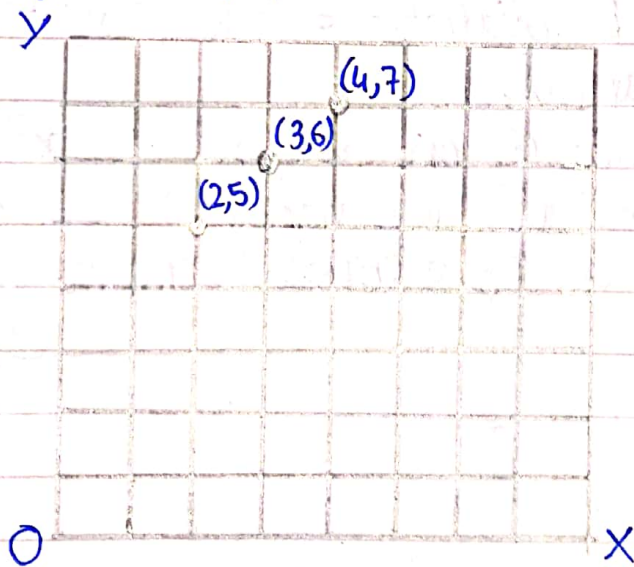
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x	2	3	4
y	5	6	7

Representing R in arrow diagram,



Representing R in graph form,



14) $\rightarrow$ Solⁿ $\rightarrow$ Polynomial is an algebraic expression in which
Here, the exponent of the variable in each term
 $\rightarrow$

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is non-negative integer.
→ Polynomials on the basis of:

(i) Number of terms.

→ Monomial $\rightarrow x^2$

Binomial $\rightarrow x^2 + 2x$

Trinomial $\rightarrow x^2 + 2x - 5$

Multinomial $\rightarrow x^2 + 2x - 5 + 3x^3$

(ii) degree;

→ 0 degree = constant = 2

1 degree = linear = $5x + 2$

2 degree = Quadratic = $6x^2 + 5x + 2$

3 degree = Cubic = $-9x^3 + 6x^2 + 5x - 2$

4 degree = Bi-quadratic = $8x^4 - 9x^3 + 6x^2 + 5x - 2$

(iii) Number of variables;

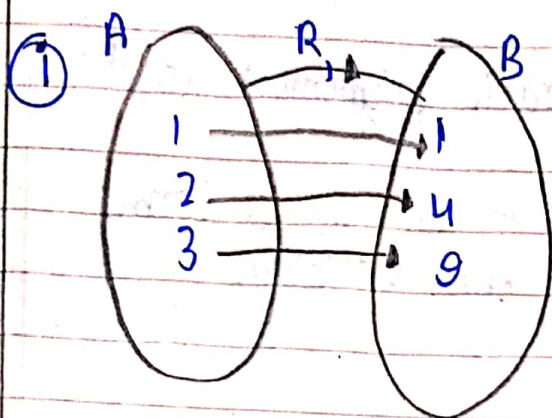
Polynomial of one variable = $x^2 + 2x^3$

Polynomial of two variable = $2xy^2 - 3y^3$

Polynomial of three variable = $2x^2yz^2 - 3y^2z^3$

15) If P and Q are non-empty set. Then every subset of $P \times Q$ (Cartesian product) is said to be a relation from P to Q. It has 3 types:-
→ One to One relation
→ One to Many relation
→ Many to one relation

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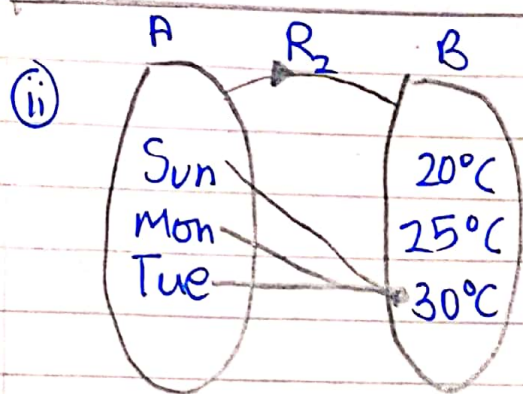
→ Soln

Here,

$1 \rightarrow 1$, $2 \rightarrow 4$ and $3 \rightarrow 9$.

Since, All the different elements of A are related to all the different elements of B.

So, $R_1: A \rightarrow B$ is One to one relation.



→ Soln

Here,

$Sun \rightarrow 30^\circ C$, $Mon \rightarrow 30^\circ C$ and $Tue \rightarrow 30^\circ C$

Since, All the different elements of A are related to 1 element of B.

So, $R_2: A \rightarrow B$ is Many to one relation.

16) → Soln

Here,

Given: $f(x) = 7x^2 - 4x - 8$

We have,

a) The highest index is 2.
 So, degree = 2

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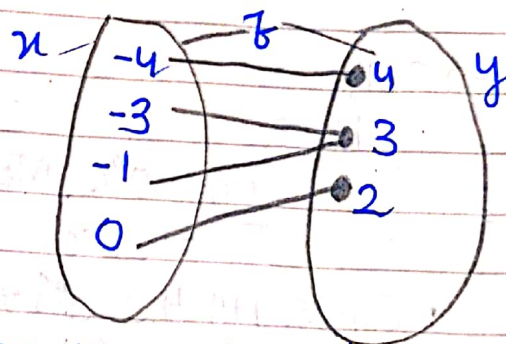
- b) i) ~~The given~~ It is a quadratic polynomial as its degree is 2.
ii) It is a ~~bin~~trinomial as it contains 3 terms.
iii) It is a polynomial of one variable.

17) → (a) → Soln

Here,

$$f = \{(4, 4), (-3, 3), (-1, 3), (0, 2)\}$$

In mapping diagram,



Since, the elements of x has an unique relation with elements of y .
So, It is a function.

(b) → Soln

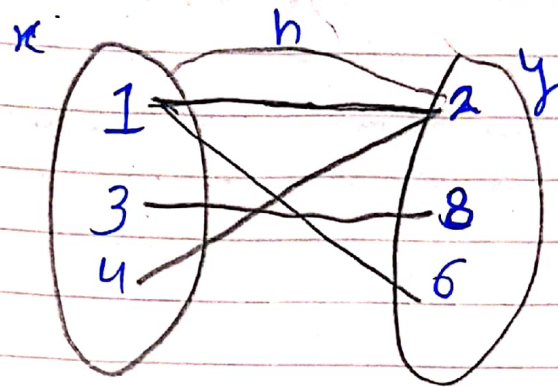
Here,

$$h = \{(1, 2), (3, 8), (4, 2), (1, 6)\}$$

In mapping diagram,



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Since, every element of x does not have a unique relation with every element of y .
So, It is not a function.

18) $\rightarrow$ Soln

Here,

$$A = \{1, 3, 4, 5\}$$

$$B = \{1, 2, 3\}$$

$$\text{Now, } A \times B = \{(1, 1), (1, 2), (1, 3), (3, 1), (3, 2), (3, 3), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3)\}$$

So,

$$a) R_1: A \rightarrow B = \{(1, 2), (1, 3)\}$$

$$b) R_2: A \rightarrow B = \{(4, 1), (4, 2)\} \cup \{(1, 1), (4, 2)\}$$

$$c) R_3: A \rightarrow B = \{(3, 1), (3, 2), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3)\}$$

$$d) R_4: A \rightarrow B = \{(1, 1), (3, 3)\}$$