

**BSCMA1001 : Activity Questions**  
**Week-1**

## **Contents**

<b>1 Lecture 1.0</b>	<b>2</b>
<b>2 Lecture 1.1</b>	<b>3</b>
<b>3 Lecture 1.2</b>	<b>4</b>
<b>4 Lecture 1.3</b>	<b>5</b>
<b>5 Lecture 1.4</b>	<b>7</b>
<b>6 Lecture 1.5</b>	<b>9</b>
<b>7 Lecture 1.6</b>	<b>11</b>
<b>8 Lecture 1.7</b>	<b>13</b>
<b>9 Lecture 1.8</b>	<b>15</b>
<b>10 Lecture 1.9</b>	<b>17</b>
<b>11 Lecture 1.10</b>	<b>19</b>

# 1 Lecture 1.0

Natural numbers and their operations:

1. Below is a list of numbers:

22, -17, 47, -2000, 0, 1, 43, 1729, 6174, -63, 100, 32, -9.

How many natural numbers are there in the given list?

- (a) 6
- (b) 7
- (c) 8
- (d) 9

2. Suppose a class has M students. If we distribute 3 pens to each student, then 4 pens will remain. If there are 70 pens in total, what is the value of M?

- (a) 22
- (b) 20
- (c) 19
- (d) 23

3. Consider '2' to be the first prime number. Which of the following will be the sixteenth prime number?

- (a) 47
- (b) 61
- (c) 59
- (d) 53

4. If  $x \bmod 3 = 1$  and  $x \bmod 7 = 4$ . Which of the following is(are) possible values for  $x$ ?

- (a) 25
- (b) 34
- (c) 58
- (d) 67

5. Suppose Sheetal's birthday is on the  $P$ th of October and Karthik's birthday is on the  $Q$ th of November, where  $P$  and  $Q$  are perfect squares. If Sheetal was born 10 days before Karthik, then the value of  $P - 2Q$  will be

Answer: 17

## 2 Lecture 1.1

Rational numbers:

1. Which of the following option(s) is(are) true?

(a)  $\frac{12}{17} > \frac{7}{13}$

(b)  $\frac{4}{7} > \frac{5}{8}$

(c)  $\frac{11}{7} > \frac{13}{8}$

(d)  $\frac{7}{15} < \frac{2}{5}$

2. Which of the following option(s) is(are) in reduced form?

(a)  $\frac{5}{60}$

(b)  $\frac{12}{27}$

(c)  $\frac{11}{18}$

(d)  $\frac{13}{91}$

3. Let  $\gcd(a, 4) = 2$  and  $\gcd(a, b) = 1$ . If  $4 > a > b$  and  $a, b$  are natural numbers, then the values of  $a$  and  $b$  are respectively

(a) 2, 1

(b) 1, 2

(c) 2, 4

(d) 4, 2

4. Which of the following statement(s) is(are) true?

(a) Integers are dense on the number line.

(b) Rational numbers are dense on the number line.

(c) Representation of a rational number is not unique.

(d) If  $\gcd(p, q) = 3$  then  $\frac{p}{q}$  could be in reduced form.

### 3 Lecture 1.2

Real and Complex numbers:

1. Which of the following statement(s) is(are) false?
  - (a) The sum of two natural numbers is always a natural number.
  - (b) The difference between two integers is always an integer.
  - (c) The product of two rational numbers is always a real number.
  - (d) The product of two irrational numbers is always an irrational number.

2. Below is a list of real numbers:  
 $\sqrt{3}$ , 2.5, e,  $\sqrt{49}$ ,  $\frac{7}{12}$ , 22,  $\pi$ , -35,  $\sqrt{6}$ , 1729, -20000

- i. How many irrational numbers are there in the given list?
  - (a) 4
  - (b) 5
  - (c) 6
  - (d) 7
- ii. How many integers are there in the given list?
  - (a) 3
  - (b) 4
  - (c) 5
  - (d) 6
3. Which of the following statement(s) is(are) true?
  - (a)  $\sqrt{-2}$  is a complex number.
  - (b) Real numbers are not dense.
  - (c) Real numbers extend rational numbers.
  - (d) None of these.

4. Which of the following rational numbers are greater than  $\sqrt{2}$  and less than  $\sqrt{3}$ ?
  - (a)  $\frac{9}{5}$
  - (b)  $\frac{3}{2}$
  - (c)  $\frac{5}{3}$
  - (d)  $\frac{17}{10}$

## 4 Lecture 1.3

Set theory:

1. Which of the following sets are same?

- (i) {Ankitha, Keerthana, Raju, Suresh }
  - (ii) {Raju, Ankitha, Keerthana, Raju, Ankitha, Suresh}
  - (iii) {Keerthana, Suresh, Dheeraj, Raju, Ankitha}
  - (iv) {Suresh, Raju, Ankitha, Keerthana}
  - (v) {Dheeraj, Raju, Soumya, Keerthana}
- (a) (i) and (ii)
  - (b) (iii),(iv) and (v)
  - (c) (i) and (iv)
  - (d) (i),(ii) and (iv)

2. Suppose  $X = \{3, \pi, \text{Tiger, Ball, -40, Dhoni}\}$ . Which of the following statement(s) is(are) true about X?

- (a) X is not a set because a collection of names of persons and numbers together will not be considered a set.
- (b) X is not a set because “ $\pi$ ” cannot be an element of a set.
- (c) X is a set because X contains items that are from more than two categories.
- (d) X is a set because it is a collection of different well-defined items.

3. Which of the following sets is a subset of the set of prime numbers?

- (a) {2,3,5,8,11}
- (b) {3,5,7,11}
- (c) {2,5,7,27}
- (d) {5,9}

4. Which of the following statement(s) is(are) false?

- (a) Venn diagrams are pictorial representations of sets.
- (b) Every set is a subset of itself.
- (c)  $X \subseteq Y$  implies that X is a proper subset of Y.
- (d) Empty set contains only one element i.e.  $\phi$ .

5. Which of the following are empty sets?
- (a) Set of all perfect squares between 45 and 50.
  - (b) Set of all integers which are both even and odd.
  - (c) Set of all years having 366 days.
  - (d) Set of all prime numbers divisible by 2.
6. If  $X = \{a, b, c\}$ , then the power set  $P(X) =$
- (a)  $\{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$
  - (b)  $\{\{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$
  - (c)  $\{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$
  - (d)  $\{\{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}\}$
7. Let  $M$  be the set of all days in a week whose starting letter is either 'S' or 'T', and  $N$  be the set of all months in a year whose ending letter is 'Y'. What are the cardinalities of  $M$  and  $N$  respectively?
- (a) 4, 3
  - (b) 3, 4
  - (c) 4, 4
  - (d) 3, 3

## 5 Lecture 1.4

Construction of subsets and set operations:

1. Which of the following is a correct representation of set comprehension?
  - (a)  $\{x \mid x \in \mathbb{N}, x \text{ is even}\}$
  - (b)  $\{x ; x \in \mathbb{N}, x \text{ is even}\}$
  - (c)  $\{x \text{ is even} \mid x \in N \mid x\}$
  - (d)  $\{x \text{ is even} ; x \in \mathbb{N}, x\}$
2. Which of the following is the set of natural numbers that are multiples of 3 or 5?
  - (a)  $\{x \mid x \in \mathbb{N}, x \bmod 3 = 0 \text{ and } x \bmod 5 = 0\}$
  - (b)  $\{x \mid x \in \mathbb{Z}, x \bmod 3 = 0 \text{ or } x \bmod 5 = 0\}$
  - (c)  $\{x \mid x \in \mathbb{Z}, x \bmod 3 = 0 \text{ and } x \bmod 5 = 0\}$
  - (d)  $\{x \mid x \in \mathbb{N}, x \bmod 3 = 0 \text{ or } x \bmod 5 = 0\}$
3. Given below is the set of students from Madras University who are going to participate in SCHROETER, a sports fest organized by I.I.T Madras:  
 $\{\text{Abbas, Akhil, Aditya, Balachandra, Bhuvan, Chidambaram, Charan, Kiran, Dayal, Deepak, Jaivardhan, Nithin, Sunil, Karthik, Rakesh}\}$   
These students are interested to play volleyball, basketball, and cricket but as there are only 15 students from Madras University, some of them are assigned to play more than one sport. Given below are the sets in which they are assigned to play volleyball, basketball, and cricket respectively.  
 $\{\text{Akhil, Charan, Deepak, Sunil, Karthik, Rakesh}\}$   
 $\{\text{Charan, Rakesh, Kiran, Chidambaram, Balachandra}\}$   
 $\{\text{Abbas, Akhil, Aditya, Bhuvan, Charan, Dayal, Deepak, Kiran, Jaivardhan, Nithin, Rakesh}\}$   
Based on the above data, answer the following questions:
  - i. Which of the following sets represents students from Madras University who play both cricket and basketball?
    - (a)  $\{\text{Abbas, Akhil, Rakesh}\}$
    - (b)  $\{\text{Bhuvan, Charan, Dayal, Kiran}\}$
    - (c)  $\{\text{Kiran, Charan, Rakesh}\}$
    - (d)  $\{\text{Aditya, Jaivardhan, Nithin, Rakesh}\}$

- ii. What is the number of students who play all the three sports?
- (a) 1
  - (b) 2
  - (c) 4
  - (d) 3
- iii. Which of the following set represents the students from Madras University who play volleyball but not cricket?
- (a) {Akhil, Rakesh, Sunil, Karthik}
  - (b) {Sunil, Karthik}
  - (c) {Deepak, Sunil, Bhuvan, Dayal, Nithin}
  - (d) {Abbas, Aditya, Bhuvan, Dayal, Kiran, Jaivardhan, Nithin}
- iv. Which of the following sets represent the students from Madras University who are not playing cricket?
- (a) {Dayal, Deepak, Kiran, Jaivardhan}
  - (b) {Rakesh, Kiran, Chidambaram, Balachandra}
  - (c) {Bhuvan, Jaivardhan, Sunil, Chidambaram}
  - (d) {Sunil, Chidambaram, Karthik, Balachandra}
4. Consider two sets that represent the items that are required to be carried by a student to an exam centre to write exam A and exam B respectively,
- {Hall ticket, Pen, Calculator, Ruler, Pencil}
- {Compass, Pencil, Drafter, Ruler, Eraser, Sharpener, Hall ticket}
- i. If exams A and B are going to be conducted simultaneously, then what are the items that are required to be carried by the student to the exam centre?
- (a) {Hall ticket, Ruler, Pencil, Eraser, Sharpener, Pen, Drafter, Compass, Calculator}
  - (b) {Calculator, Ruler, Pencil, Hall ticket, Pen, Paper, Compass, Drafter}
  - (c) {Pen, Calculator, Pencil, Hall ticket, Ruler, Compass, Drafter, Eraser}
  - (d) Ruler, Pencil, Compass, Drafter, Eraser, Sharpener, Hall ticket, Calculator
- ii. If a student forgets to bring her Calculator, which exam will she not be allowed to write?
- (a) Exam B
  - (b) She can write both the exams
  - (c) Exam A
  - (d) None of the above

## 6 Lecture 1.5

Sets examples:

1. Which of the following sets is(are) infinite?
  - (a) Set of all Indian Nobel laureates.
  - (b) Set of squares of all odd natural numbers.
  - (c) Set of all countries in the world.
  - (d) Set of all leap years.
2. Which of the following set comprehension defines real numbers in interval  $[-2, 0) \cup (4, 8]$ ?
  - (a)  $\{ r \mid r \in \mathbb{R}, -2 \leq r \leq 8\}$
  - (b)  $\{ r \mid r \in \mathbb{R}, -2 \leq r < 0 \text{ and } 4 < r \leq 8\}$
  - (c)  $\{ r \mid r \in \mathbb{R}, -2 \leq r < 0 \text{ or } 4 < r \leq 8\}$
  - (d)  $\{ r \mid r \in \mathbb{R}, -2 \leq r \leq 0 \text{ and } 4 \leq r \leq 8\}$
3. Which of the following set comprehensions define squares of the first 100 natural numbers?
  - (a)  $\{n \mid n \in \mathbb{N}, \sqrt{n} \in \mathbb{N} \text{ and } n < 100\}$
  - (b)  $\{n^2 \mid n \in \mathbb{N}, n < 100\}$
  - (c)  $\{n \mid n \in \mathbb{N}, \sqrt{n} \in \mathbb{N} \text{ and } n < 10000\}$
  - (d)  $\{n^2 \mid n \in \mathbb{N}, n < 10000\}$
4. Which of the following statement(s) is(are) true?
  - (a) Empty set contains only one element i.e.  $\phi$ .
  - (b) Set with  $n$  elements has  $2^{n-1}$  subsets.
  - (c) Empty set is an element in the power set of a set.
  - (d) Power set is a set of all the subsets of a set.
5. Which of the following intervals are subsets of  $[2, 3]$ ?
  - (a)  $( (0, 2.3] \cup (2.3, 3] ) \cap (0, 2.3)$
  - (b)  $( [2, 2.5] \cup (2.5, 4] ) \setminus (0, 2.3)$
  - (c)  $( [2, 2.5] \cup (2.5, 4] ) \cap (0, 3]$
  - (d)  $( (0, 2.3] \cup (2.2, 3] ) \setminus (0, 2.3)$

6. Let M be the set of all real numbers that are strictly greater than 6 or strictly less than -6. How can we represent B in set comprehension form, where B is a subset of M and has only integers as elements?
- (a)  $B = \{ z \mid z \in \mathbb{Z}, z \in [-6,6]\}$
  - (b)  $B = \{ z \mid z \in \mathbb{Z}, z \in (-6,6)\}$
  - (c)  $B = \{ z \mid z \in \mathbb{Z}, z \in (-\infty, -6) \cup (6, \infty)\}$
  - (d)  $\{ z \mid z \in \mathbb{Z}, z \in (-\infty, -6] \cup [6, \infty)\}$
7. Two finite sets A and B are such that the total number of subsets of A is 56 more than the total number of subsets of B. What are the cardinalities of A and B respectively?
- (a) 6, 3
  - (b) 8, 4
  - (c) 7, 1
  - (d) 8, 3

## 7 Lecture 1.6

Examples of set operations and counting problems:

1. In a class of 40 students, 20 took Mathematics, 18 took Statistics, 16 took English, 7 took Mathematics and Statistics, 7 took Mathematics and English, 9 took Statistics and English, and 3 took all the three courses. How many students are not taking any of these courses?
  - (a) 3
  - (b) 4
  - (c) 5
  - (d) 6
2. In a survey, it is found that 30 people like apples, 45 people like oranges, and 20 people like both apples and oranges. How many people like only one fruit?  
Answer: 35
3. In a class, 50 students play cricket, 35 play football, 14 play both, and 9 play neither. How many students are there in the class?
  - (a) 80
  - (b) 108
  - (c) 90
  - (d) 62
4. A group of 25 people are planning to get together to celebrate their 10 years of friendship. Out of them, 9 suggested to go to Goa, 8 suggested to go to Bangkok, X suggested to go to Pondicherry and 3 of them did not suggest any place. Considering each person suggested only one place, what is the value of X?
  - (a) 5
  - (b) 3
  - (c) 4
  - (d) Data is insufficient.

5. An advertising agency finds that, of its 200 clients who use Television or Radio or both, 150 use Television. How many use only Radio?

- (a) 150
- (b) 100
- (c) 50
- (d) Data is insufficient.

## 8 Lecture 1.7

Relations:

1. Let  $A = \{1, 4\}$  and  $B = \{2, 4, 6, 8\}$ . Which of the following is the Cartesian product of  $A$  and  $B$ ?
  - (a)  $\{(1, 2), (1, 4), (1, 6), (1, 8), (4, 1), (4, 4), (4, 6), (4, 8)\}$
  - (b)  $\{(1, 2), (1, 4), (1, 6), (1, 8), (4, 2), (4, 4), (4, 6), (4, 8)\}$
  - (c)  $\{(1, 2), (1, 4), (1, 6), (1, 8), (2, 4), (4, 2), (4, 6), (4, 8)\}$
  - (d)  $\{(1, 6), (1, 8), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (4, 8)\}$
2. If set  $M$  contains 4 elements and set  $N$  contains 3 elements, then  $M \times N$  contains  $x$  elements. What is the value of  $x$ ?  
**Answer: 12**
3. Suppose the Cartesian product  $A \times B$  has 18 elements. Which of the following options may represent the number of elements in  $A$  and  $B$ ?
  - (a) 3, 9
  - (b) 2, 9
  - (c) 9, 9
  - (d) 6, 3
4. Which of the following statement(s) is(are) true?
  - (a) In a set, order of elements is not important.
  - (b) A relation is a subset of Cartesian product.
  - (c) In each pair of Cartesian product, order is not important.
  - (d) All of the above.

5. Let  $B = \{\text{Anil, Ramu, Suraj}\}$  and  $G = \{\text{Neha, Keerthi}\}$  be the sets of boys and girls respectively. Ramu is brother of Neha, Anil is brother of Keerthi, Suraj is brother of Neha and Keerthi.

Let us define a relation  $R$  as follows,

$R = \{(a, b) \mid (a, b) \in B \times G, a \text{ is brother of } b\}$ . Which of the following will be  $R$ ?

- (a)  $\{(\text{Anil, Keerthi}), (\text{Suraj, Neha}), (\text{Ramu, Neha}), (\text{Suraj, Keerthi})\}$
- (b)  $\{(\text{Anil, Keerthi}), (\text{Ramu, Keerthi}), (\text{Ramu, Neha}), (\text{Suraj, Neha})\}$
- (c)  $\{(\text{Anil, Neha}), (\text{Ramu, Keerthi}), (\text{Ramu, Neha}), (\text{Suraj, Keerthi})\}$
- (d)  $\{(\text{Anil, Keerthi}), (\text{Ramu, Neha}), (\text{Suraj, Neha}), (\text{Ramu, Keerthi}), (\text{Anil, Neha}), (\text{Suraj, Keerthi})\}$

6. Let  $S$  be a set of students who are studying B.tech first year at I.I.T Madras. Which of the following relations is a symmetric relation?

- (a)  $\{(a, b) \mid a, b \in S, a \text{ is younger than } b\}$
- (b)  $\{(a, b) \mid a, b \in S, a \text{ got more marks in mathematics course than } b\}$
- (c)  $\{(a, b) \mid a, b \in S, a \text{ is classmate of } b\}$
- (d)  $\{(a, b) \mid a, b \in S, a \text{ is taller than } b\}$

7. Which of the following statement(s) is(are) incorrect?

- (a) An equivalence relation partitions a set.
- (b) An equivalence class is same as equivalence relation.
- (c) Antisymmetric relation is an equivalence relation.
- (d) Elements in Cartesian product will only be in pairs.

## 9 Lecture 1.8

Function:

- Suppose  $f : \mathbb{Z} \rightarrow \mathbb{Z}$  is a function defined by  $f(k) = k^3 + 4k - 10$ . The value of  $f(k)$  at  $k = 4$  is

Answer: 70

- Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  be a function and  $f(x) = |x| + 5$ . Which of the following is(are) true?

- (a) Domain of  $f(x)$  is  $\mathbb{R}$
- (b) Range of  $f(x)$  is  $\mathbb{R}$
- (c) Domain of  $f(x)$  is  $[5, \infty)$
- (d) Range of  $f(x)$  is  $[5, \infty)$

- Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  be a function and  $f(x) = |(x+4)(4x-10)|$ . Which of the following is(are) true?

- (a)  $f$  is an injective function.
- (b)  $f$  is a surjective function.
- (c)  $f$  is a bijective function.
- (d) None of these.

- Which of the following statement(s) is(are) false?

- (a) Range of a function is a subset of co-domain.
- (b) A function is bijective if and only if it is both injective and surjective.
- (c) Every relation is a function.
- (d) Co-domain of a function is a subset of domain.

- Let  $x \in \mathbb{R}$ . Which of the following functions is(are) injective?

- (a)  $f(x) = \sqrt{10-x}$
- (b)  $f(x) = \frac{7x+6}{3x}$
- (c)  $f(x) = 2x + 9$
- (d)  $f(x) = \frac{(5x+4)(2x-3)}{2}$

6. Suppose  $f : \mathbb{Z} \rightarrow \mathbb{Z}$  is a function defined by  $f(x) = Ax + B$ . For which of the following integer values of A and B, is the given function bijective?

- (a)  $A = 0, B = \{z \mid z \in \mathbb{Z}\}$
- (b)  $A = \{-1, 1\}, B = \{z \mid z \in \mathbb{Z}\}$
- (c)  $B = \{-1, 1\}, A = 0$
- (d)  $B = 0, A = \{z \mid z \in \mathbb{Z}\}$

## 10 Lecture 1.9

Relations examples:

1. Let  $A = \{x \mid x \in \mathbb{N}, x < 10 \text{ and } x \text{ is odd}\}$   
 $B = \{y \mid y \in \mathbb{N}, y \text{ is a perfect square and } 15 < y < 40\}$ 
  - i. Which of the following is a subset of  $B \times A$ ?
    - (a)  $\{(36,3), (25,5), (36,6)\}$
    - (b)  $\{(1,25), (6,36), (7,25), (3,36)\}$
    - (c)  $\{(16,5), (25,9), (36,3), (16,1)\}$
    - (d)  $\{(1,16), (5,16), (3,36), (9,36), (7,25)\}$
  - ii. Which of the following is a subset of  $A \times A$ ?
    - (a)  $\{(1,3), (3,5), (5,9), (7,3), (7,7)\}$
    - (b)  $\{(36,25), (25,25), (36,36), (16,25)\}$
    - (c)  $\{(3,3), (1,5), (3,6), (9,9)\}$
    - (d)  $\{(3,5), (5,1), (9,4), (1,1), (7,1)\}$
  - iii. Which of the following is(are) element(s) of  $A \times B \times A$ ?
    - (a)  $(2, 25, 3)$
    - (b)  $(5, 25, 9)$
    - (c)  $(3, 36, 9)$
    - (d)  $(5, 16, 1)$
2. Suppose the Cartesian product  $M \times M$  has 9 elements among which 2 elements are  $(2, 4)$  and  $(3, 2)$ .
  - i. Which of the following sets is  $M$ ?
    - (a)  $\{9, 2, 4\}$
    - (b)  $\{3, 2, 9\}$
    - (c)  $\{2, 3, 4\}$
    - (d)  $\{3, 4, 9\}$
  - ii. Remaining elements of  $M \times M$  are
    - (a)  $\{(2,3), (2,2), (3,4), (3,2), (4,4), (4,2), (3,3)\}$
    - (b)  $\{(2,3), (2,2), (3,4), (4,3), (4,4), (4,2), (3,3)\}$
    - (c)  $\{(2,3), (2,2), (4,3), (2,4), (4,4), (4,2), (3,3)\}$
    - (d)  $\{(2,2), (2,3), (4,3), (3,2), (3,3), (4,4), (3,4)\}$

3. Suppose the relation  $R = \{(Snail, Frog), (Bird, Bird), (Fox, Frog), (Snail, Fox)\}$  is defined on the set  $S = \{Snail, Fox, Bird, Frog\}$ .
- The relation  $R$  on the set  $S$  is(are)
    - Reflexive
    - Symmetric
    - Transitive
    - None of these.
  - Let  $P$  be a subset of  $[(S \times S) \setminus R]$ . What is the set of possible cardinalities of  $P$ ?
    - $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
    - $\{\}$
    - $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$
    - $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
  - What is the minimum number of elements of the Cartesian product  $S \times S$  that need to be added to  $R$  such that the relation becomes symmetric?
    - 4
    - 8
    - 2
    - 3

## 11 Lecture 1.10

Functions examples:

1. If  $f : \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = \frac{x+12}{4x-8}$ , then the domain of the function f is

- (a)  $\mathbb{R}$
- (b)  $\mathbb{R} \setminus \{\frac{1}{4}\}$
- (c)  $\mathbb{R} \setminus \{-12\}$
- (d)  $\mathbb{R} \setminus \{2\}$

2. The product of the minimum value of the function  $f(x) = 9|x| - 8$  and the maximum value of the function  $g(x) = 11 - |x + 8|$  is

Answer: -88

3. Which of the following functions is always non-negative?

- (a)  $f(x) = \sqrt{3x + 15}$
- (b)  $f(x) = |x|$
- (c)  $f(x) = \frac{30-11x}{5x+60}$
- (d)  $f(x) = 4x + 19$

4. Let us define a function  $f : \mathbb{N} \rightarrow \mathbb{N}$  as follows,

$$f(n) = \begin{cases} \frac{n+1}{2} & n \text{ is odd} \\ \frac{n}{2} & n \text{ is even} \end{cases} \quad (1)$$

Which of the following is true?

- (a)  $f$  is one to one and onto
- (b)  $f$  is one to one but not onto
- (c)  $f$  is onto but not one to one
- (d)  $f$  is neither one to one nor onto

5. If  $f(x) = |x + 2|$  and  $g(x) = x^2 - 4$ , then which of the following is true?

- (a) The value  $f(x)$  is greater than  $g(x)$  at  $x = 1$
- (b) The value  $g(x)$  is greater than  $f(x)$  at  $x = -2$
- (c) The value  $g(x)$  is greater than  $f(x)$  at  $x = 3$
- (d) The value  $f(x)$  is greater than  $g(x)$  at  $x = -3$

6. If  $f : \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = \sqrt{14 - (3x + \frac{35-5x}{4})}$ , then the domain of the function  $f$  is

- (a)  $(-\infty, -3]$
- (b)  $[3, \infty)$
- (c)  $(-\infty, 3]$
- (d)  $[-3, \infty)$

7. The domain and range of the function that is shown in Figure 1 are  $[m, x]$  and  $[n, y]$  respectively, where  $m, n, x, y \in \mathbb{R}$ .

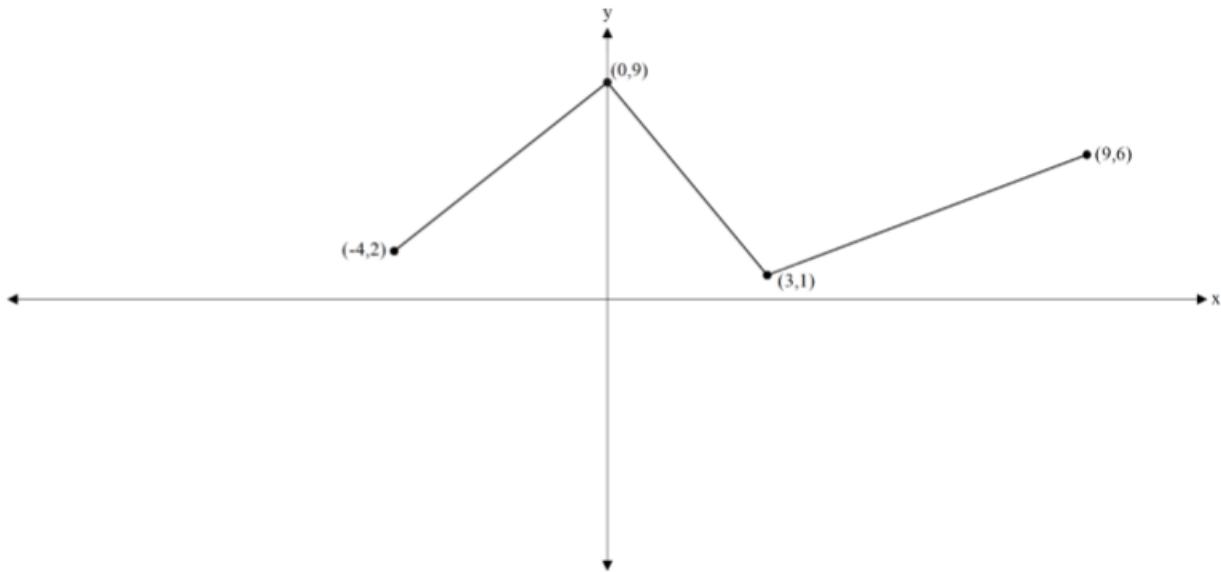


Figure 1

i. What are the values of  $m, n$  respectively?

- (a) 0, 3
- (b) -4, 1
- (c) -4, 9
- (d) 2, 6

ii. What are the values of  $x, y$  respectively?

- (a) 9, 9
- (b) -4, 9
- (c) 1, 9
- (d) 2, 6

**BSCMA1001: Activity Questions**  
**Week-2**

## **Contents**

<b>1</b>	<b>Lecture-2.1</b>	<b>2</b>
I	Multiple Choice Questions (MCQ):	2
II	Multiple Select Questions (MSQ):	2
<b>2</b>	<b>Lecture-2.2</b>	<b>3</b>
I	Multiple Choice Questions (MCQ):	3
II	Multiple Select Questions (MSQ):	3
<b>3</b>	<b>Lecture-2.3</b>	<b>4</b>
I	Multiple Choice Questions (MCQ):	4
<b>4</b>	<b>Lecture-2.4</b>	<b>5</b>
I	Multiple Choice Questions (MCQ):	5
II	Multiple Select Questions (MSQ):	5
<b>5</b>	<b>Lecture-2.5</b>	<b>6</b>
I	Multiple Choice Questions (MCQ):	6
II	Multiple Select Questions (MSQ):	6
<b>6</b>	<b>Lecture-2.6</b>	<b>7</b>
I	Multiple Choice Questions (MCQ):	7
II	Multiple Select Questions (MSQ):	7
<b>7</b>	<b>Lecture-2.7</b>	<b>9</b>
I	Multiple Choice Questions (MCQ):	9
II	Multiple Select Questions (MSQ):	9
<b>8</b>	<b>Lecture-2.8</b>	<b>11</b>
I	Multiple Choice Questions (MCQ):	11
II	Multiple Select Questions (MSQ):	11

# 1 Lecture-2.1

## I Multiple Choice Questions (MCQ):

1. Choose the correct option with respect to the points P(5,-3), Q(-3,3), R(0,-100), and S(-2.5,0) on the rectangular coordinate system.
  - a Point R does not lie in any quadrant.
  - b Points P and R lie in Quadrant III.
  - c Points S and Q lie in Quadrant II.
  - d Points R and S cannot be represented on the rectangular coordinate system.

## II Multiple Select Questions (MSQ):

1. Which of the following is/are correct with respect to the rectangular coordinate system?
  - a The horizontal line is called  $Y$ -axis.
  - b The point of intersection of the  $X$  and  $Y$  axes is called the origin.
  - c The vertical line is called  $X$ -axis.
  - d Any point on the coordinate plane can be represented as an ordered pair  $(x, y)$ .
2. Identify the incorrect options for the representation of a point on the coordinate plane.
  - a Quadrant I:  $(+, +)$ .
  - b Quadrant IV:  $(-, +)$ .
  - c Quadrant II:  $(-, -)$ .
  - d Quadrant III:  $(-, +)$ .
  - e On X-axis:  $(0, \pm)$ .
  - f On Y-axis:  $(\pm, 0)$ .
  - g Origin  $(0, 0)$ .

## 2 Lecture-2.2

### I Multiple Choice Questions (MCQ):

1. The distance of a point  $P(1, |\tan \theta|)$  from the origin is  
(hint:  $|\tan^2 \theta| + 1 = |\sec^2 \theta|$ )
  - a 1
  - b  $|\sec \theta|$ .
  - c  $|\tan \theta|$ .
  - d  $-\cosec \theta$
  - e 0
2. The distance of a point lying on the X-coordinate from the origin is
  - a The value of the vertical distance of that point from the origin.
  - b Cannot be determined.
  - c The value of the horizontal distance of that point from the origin.
  - d 0
3. The distance between  $P(-5,-2)$  and  $Q(-2,2)$  is
  - a 7
  - b 9
  - c -6
  - d 5

### II Multiple Select Questions (MSQ):

1. Which of the following is/are true, if  $D$  is the distance between two points  $(x_1, y_1)$  and  $(x_2, y_2)$ ?
  - a  $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
  - b  $D = \sqrt{(x_1 - x_2)^2 + (y_2 - y_1)^2}$
  - c  $D = \sqrt{x^2 + y^2}$ , (if one of the points is at origin, were  $x, y$  represents any point)
  - d  $D = \sqrt{(x_2 - x_1) + (y_2 - y_1)}$

### 3 Lecture-2.3

#### I Multiple Choice Questions (MCQ):

1. The coordinates of the midpoint of points  $P(4, -2)$  and  $Q(-1, -1)$  are
  - a (0.5, -0.5)
  - b (1.5, -1.5)
  - c (-0.5, -0.5)
  - d (-0.5, 0.5)
2. The ratio in which the origin cuts the line segment  $P(2, 8)$  and  $Q(-3, -2)$  in  $(m : n)$  form is
  - a 0
  - b 1 : 2
  - c 3 : 8
  - d Origin do not lie on the line segment.
  - e 2 : 1
3. If the origin cuts the line segment  $P(-2, -4)$ ,  $Q(6, k)$  in the ratio 1 : 3, then the value of  $k$  is
  - a Cannot be determined
  - b 0
  - c 12
  - d 18

## 4 Lecture-2.4

### I Multiple Choice Questions (MCQ):

1. Choose the correct statement based on the three points  $P(0, 10)$ ,  $Q(-20, -30)$  and  $R(10, 30)$ .
  - a The given points form a triangle of area 5 square units.
  - b The given points form a triangle of area 15 square units.
  - c The given points do not form a triangle.
  - d None of the above.
2. The area of the triangle formed by the midpoints of line segments  $PQ$ ,  $QR$ , and  $RP$  where the coordinates of  $P$ ,  $Q$ , and  $R$  are  $(0,0)$ ,  $(3,0)$ , and  $(3,4)$  respectively, is.
  - a 1.5 square units.
  - b 8.5 square units.
  - c 2.5 square units.
  - d 7.5 square units.

### II Multiple Select Questions (MSQ):

1. Which of the following gives the area (A) of a triangle whose vertices are  $P(x_1, y_1)$ ,  $Q(x_2, y_2)$ ,  $R(x_3, y_3)$ ?
  - a  $A = \frac{1}{2} [| x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) |]$
  - b  $A = \frac{1}{2} [| x_2(y_3 - y_1) + x_1(y_2 - y_3) + x_3(y_2 - y_1) |]$
  - c  $A = \frac{1}{2} [| x_1(y_2 - y_3) + x_3(y_1 - y_2) + x_2(y_3 - y_1) |]$
  - d  $A = \frac{1}{2} [| x_3(y_1 - y_2) + x_1(y_2 - y_3) + x_2(y_3 - y_1) |]$

## 5 Lecture-2.5

### I Multiple Choice Questions (MCQ):

1. Find the slope of a line passing through the origin and the point (-3, -2).

- a  $\frac{4}{6}$
- b  $\frac{-2}{3}$
- c  $\frac{-1}{3}$
- d  $\frac{3}{2}$

2. If the slope of a line passing through  $P(1,0)$  and  $Q(-2, k)$  is 1, then the value of  $k$  is

- a -2
- b -3
- c 0
- d 2

### II Multiple Select Questions (MSQ):

1. Which of the following is/are correct with respect to the slope of a line?

- a The line parallel to the  $X$ -axis has slope of value 1.
- b The slope of a line which is parallel to the  $Y$ -axis is not defined.
- c The line parallel to the  $Y$ -axis has a slope of 90.
- d The line parallel to the  $X$ -axis has a slope 0.
- e The slope of a line is always positive.

2. Through which of the following points do lines of slope 0 pass?

- a  $(0, 0)$
- b  $(-100, 0.5)$
- c  $(-0.05, 0)$
- d  $(0, 4)$

## 6 Lecture-2.6

### I Multiple Choice Questions (MCQ):

1. If a line is perpendicular to the  $X$ -axis, then the slope of such line is
  - a 0
  - b Not defined.
  - c 1
  - d -1
2. If a line is parallel to a line which is perpendicular to the  $Y$ -axis, then the slope of the first line is
  - a 0
  - b Not defined.
  - c 1
  - d -1
3. The angle formed by the intersection of 2 lines with slopes 1 and -1 is
  - a 0 degree.
  - b 45 degree.
  - c 90 degree.
  - d 180 degree.

### II Multiple Select Questions (MSQ):

1. If  $\ell_1$  and  $\ell_2$  are lines parallel to each other with slopes  $m_1$  and  $m_2$  and with inclinations  $\alpha$  and  $\beta$  respectively, then which of the following is/are correct?
  - a  $\alpha = \beta$  and,  $\tan \alpha = \tan \beta$
  - b  $\alpha \neq \beta$  and,  $\tan \alpha \neq \tan \beta$
  - c  $m_1 = m_2$ , always
  - d  $m_1 \times m_2 = -1$
2. Lines  $\ell_1$  and  $\ell_2$  are perpendicular to each other with slopes  $m_1$  and  $m_2$  and with inclinations  $\alpha$  and  $\beta$  respectively. Then, which of the following is/are correct?
  - a  $\alpha = \beta$  and,  $\tan \alpha = \tan \beta$
  - b  $\beta = 90 + \alpha$ , and  $\tan \alpha = -\cot \beta$
  - c  $\beta = 90 + \alpha$ , and  $\tan \beta = -\cot \alpha$

d  $m_2 = -\frac{1}{m_1}$

3. If two lines  $\ell_1$  and  $\ell_2$  with slopes  $m_1$  and  $m_2$  and inclinations  $\alpha_1$  and  $\alpha_2$  ( $\alpha_2 > \alpha_1$ ) respectively intersect each other and make an acute angle  $\theta$  and an obtuse angle  $\phi$ , then which of the following is/are correct?

a  $\tan \theta = \frac{\tan \alpha_2 - \tan \alpha_1}{1 + \tan \alpha_1 \times \tan \alpha_2} \neq \frac{m_1 - m_2}{1 + m_1 \times m_2}$

b  $m_1 \times m_2 = -1$

c  $\tan \phi = \frac{m_1 - m_2}{1 + m_1 \times m_2}$

d  $\tan \theta = \tan (\alpha_2 - \alpha_1)$

## 7 Lecture-2.7

### I Multiple Choice Questions (MCQ):

1. Which of the following represents a equation of the horizontal line?
  - a  $y = 0$
  - b  $x = 5$
  - c  $x = -2$
  - d  $x = 0$
2. The equation of a line parallel to the  $X$ -axis and passing through the point  $(-2,0)$  is
  - a  $y = 0$
  - b  $x = 0$
  - c  $x = -2$
  - d  $y = -2$
3. The equation of a line passing through the origin and with slope -1 is
  - a  $y = x$
  - b  $y = -x + 1$
  - c  $y = -x$
  - d  $y = -x - 1$
4. The equation of a line passing through the origin and  $(-1, -3)$  is
  - a  $y = 3x$
  - b  $y = -3x + 3$
  - c  $y = -3x$
  - d  $y = -\frac{x}{3}$

### II Multiple Select Questions (MSQ):

1. Which of the following is/are correct with respect to a horizontal line?
  - a It is parallel to the  $Y$ -axis.
  - b Point  $(0,0)$  can lie on a horizontal line.
  - c The equation of a horizontal line can be  $x=a$ .
  - d Points lying on a horizontal line are of the form  $(x, a)$ .
2. Which of the following is/are correct with respect to a vertical line?

- a It is parallel to the  $X$ -axis.
- b Points lying on a vertical line are of the form  $(a, y)$ .
- c Point  $(0, 0)$  can lie on a vertical line.
- d The equation of a line can be  $y = b$ .

3. Choose the correct option.

- a The equation of a line in point slope form and two point form can both be converted to  $y = mx + c$  form.
- b  $(y - y_0) = m(x - x_0)$  is a two point form of equation of line.
- c The equation of a horizontal line can be  $x = a$ .
- d  $(y - y_1) = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1)$  is a two point form of the equation of a line.

## 8 Lecture-2.8

### I Multiple Choice Questions (MCQ):

1. The equation of a line passing through (-1,-1) with value of slope 1 is

- a  $y = -x$
- b  $\textcolor{red}{y} = x$
- c  $y = -x - 1$
- d  $y = -x + 1$

2. The equation of a line which cuts the  $X$ -axis at (5,0) and  $Y$ -axis at (0,5) is

- a  $x + y = -1$
- b  $\textcolor{red}{y} = -x + 5$
- c  $-y = -x + 1$
- d  $y = 5x + 5$

3. The  $X$ -intercept of a line  $y = 3x + 1$  is

- a -1
- b  $\frac{1}{2}$
- c  $-\frac{1}{2}$
- d  $-\frac{1}{3}$

### II Multiple Select Questions (MSQ):

1. Choose the correct answers.

- a  $\textcolor{red}{y} = 2x - 8$  is the equation of a line in slope intercept form where -8 is  $Y$ -intercept.
- b  $\textcolor{red}{y} = 0$  is the equation of a line passing through the origin.
- c  $y = 2x - 8$  does not meet either the origin and the  $X$ -axis.
- d  $y = -2(x + 1)$  is the equation of a line in slope-intercept form.

**BSCCS1001: Activity Questions**  
**Week-3**

## Contents

<b>1</b>	<b>Lecture-1</b>	<b>2</b>
1.1	Multiple Choice Question . . . . .	2
1.2	Multiple Select Question . . . . .	2
1.3	Numerical Answer Type . . . . .	3
<b>2</b>	<b>Lecture-2</b>	<b>4</b>
2.1	Multiple Select Question . . . . .	4
2.2	Numerical Answer Type . . . . .	4
<b>3</b>	<b>Lecture-3</b>	<b>5</b>
3.1	Multiple Choice Question . . . . .	5
3.2	Numerical Answer Type . . . . .	5
<b>4</b>	<b>Lecture-4</b>	<b>6</b>
4.1	Multiple Select Question . . . . .	6
4.2	Numerical Answer Type . . . . .	6
<b>5</b>	<b>Lecture-5</b>	<b>7</b>
5.1	Numerical Answer Type . . . . .	7
5.2	Multiple Choice Question . . . . .	7

# 1 Lecture-1

The general equation of a line

## Syllabus covered

- 1-Different forms of the equation of a line.
- 2-The general equation of a line.

### 1.1 Multiple Choice Question

1. If the x-intercept and the y-intercept of a straight line are -6 and 7 respectively, then choose the correct equation of the line.
  - a  $7x - 6y + 42 = 0$ .
  - b  $-6x + 7y - 1 = 0$ .
  - c  $7x - 6y - 1 = 0$ .
  - d  $-6x + 7y - 2 = 0$ .
2. The slope of the line  $6x - 2y + 8 = 0$  is
  - a 2
  - b 3
  - c 5
  - d 1

### 1.2 Multiple Select Question

3. If the general equation of a line is  $3x + 5y - 30 = 0$ , then choose the set of correct options.
  - a The intercept form of the line is  $\frac{x}{10} + \frac{y}{6} = 1$ .
  - b The slope intercept form of the line is  $y = -3x - 30$ .
  - c The intercept form of the line is  $5x + 3y - 30 = 1$ .
  - d The slope intercept form of the line is  $y = -\frac{3}{5}x + 6$ .

### **1.3 Numerical Answer Type**

4. The equation of a line is  $4x - 2y - 12 = 0$ . Answer the following questions with respect to the above line.

i) What is the slope of the line?

Ans:2

ii) What is the  $x$ -intercept?

Ans: 3

iii) What is the  $y$ -intercept?

Ans: -6

## 2 Lecture-2

The equation of parallel and perpendicular lines in the general form

### Syllabus covered

- 1- Introduction to parallel lines.
- 2- Introduction to perpendicular lines.

### 2.1 Multiple Select Question

1. Which of the following statements are true?
  - a Lines  $2x + 3y - 8 = 0$  and  $3x - y - 2 = 0$  are parallel lines.
  - b Lines  $3x + 5y - 10 = 0$  and  $6x + 10y - 26 = 0$  are parallel lines.
  - c Lines  $6x + 8y - 20 = 0$  and  $4x - 3y = 0$  are perpendicular to each other.
  - d Lines  $2x - 3y + 8 = 0$  and  $3x + 2y - 18 = 0$  are not perpendicular to each other.
  - e Lines  $4x + 5y + 10 = 0$  and  $10x - 8y - 16 = 0$  are perpendicular to each other.

### 2.2 Numerical Answer Type

2. Given lines  $4x + 2ky + 5 = 0$  and  $12x + 6y + 15 = 0$  are parallel, find the value of  $k$ .  
(Ans: 1 )

### 3 Lecture-3

The equation of a perpendicular line passing through a point

#### Syllabus covered

The equation of a line passing through a point and perpendicular to a given line.

#### 3.1 Multiple Choice Question

1. The equation of a line passing through the point (3,4) and perpendicular to the line  $3x + 4y - 8 = 0$  is
  - a  $8x - 6y = 0$ .
  - b  $2x + 8y = 38$ .
  - c  $8x + 4y = 5$ .
  - d  $x + y = 1$ .

#### 3.2 Numerical Answer Type

2. Given lines  $18x - 8y + 30 = 0$  and  $4x + ky + 5 = 0$  are perpendicular to each other, find the value of  $k$ .  
(Ans: 9)

## 4 Lecture-4

The distance of a line from a given point

### Syllabus covered

- 1- The distance of a line from a given point.
- 2- The distance between two parallel lines.

### 4.1 Multiple Select Question

1. If the general form of a line is  $3x + 2y - 5 = 0$ , then choose the correct set of options.
  - a The slope of the given line is  $-\frac{3}{2}$ .
  - b The  $x$ -intercept is 3.
  - c The point where the given line cuts the X-axis is  $(\frac{5}{3}, 0)$ .
  - d The  $y$ -intercept is 2.
  - e The point where the given line cuts the Y-axis is  $(0, \frac{5}{2})$ .
2. Given the point  $(-2, 1)$  and the line  $-3x + 4y - 7 = 0$ , choose the correct set of options.
  - a The distance between  $(-2, 1)$  and the line  $-3x + 4y - 7 = 0$  is  $\frac{1}{2}$ .
  - b The slope of the given line is 5.
  - c The distance between the point  $(-2, 1)$  and the line  $-3x + 4y - 7 = 0$  is  $\frac{3}{5}$ .
  - d The  $y$ -intercept of the given line is  $\frac{7}{4}$ .

### 4.2 Numerical Answer Type

3. Find the distance between the two parallel lines  $4x + 3y + 5 = 0$  and  $8x + 6y - 30 = 0$ .  
(Ans: 4).
4. If the distance between the point  $(-1, 3)$  and the line  $4x + c = 0$  is  $\frac{3}{2}$ , then find the value of  $c$  where  $c$  is a positive number.  
(Ans: 10).
5. The coordinates of the vertices of a triangle are  $(0, 3)$ ,  $(0, 0)$ ,  $(2, 0)$ . Find the area of the triangle.  
(Ans: 3)

## 5 Lecture-5

### The straight line fit

#### Syllabus covered

- 1- Introduction to the best fit line among the given set of lines for a given set of points.
- 2- Motivation for the sum squares error.

### 5.1 Numerical Answer Type

1. If a line fit  $y = x + 1$  is given for the data as shown in Table AQ-3.1, then compute the Sum Squares Error (SSE) .

$x$	1	2	3	4	6
$y$	1	1	2	5	7

Table AQ-3.1

(Ans: 9)

### 5.2 Multiple Choice Question

2. If the relation between  $x$  and  $y$  is as shown in Table AQ-3.2, then which among the following lines is the best fit?

$x$	0	1	2	3	4	5	6
$y$	1	3	4	2	5	0	8

Table AQ-3.2

- a  $y = 2x$  with SSE=143.
- b  $y = x$  with SSE=40.
- c  $y = 3x$  with SSE=428.
- d  $y = 4x$  with SSE=895.

**BSCMA1001: Activity Questions**  
**Week-4**

## **Contents**

<b>1 Lecture 4.1</b>	<b>2</b>
<b>2 Lecture 4.2</b>	<b>3</b>
<b>3 Lecture 4.3</b>	<b>5</b>
<b>4 Lecture 4.4</b>	<b>6</b>

# 1 Lecture 4.1

## Quadratic Functions

1. Which of the graphs in Figure 1 represents the following function:  $y = x^2 - x + 1$ ?
  - a Option D
  - b Option B
  - c Option C
  - d Option A
2. Which of the graphs in Figure 1 represents the following function:  $y = -x^2 + 2x + 1$ ?
  - a Option B
  - b Option A
  - c Option C
  - d Option D

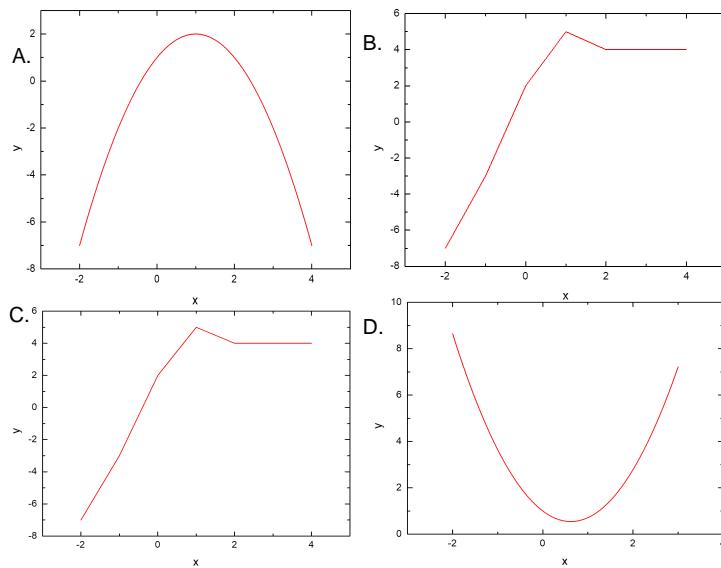


Figure 1: Options for Question 1 and Question 2

3. For the function  $y = x^2 + 10x + 1$ , determine whether  $y$  has a minimum or maximum value and identify it from the options given below.
  - a Maximum value -24
  - b Minimum value -24
  - c Maximum value 76
  - d Neither maximum nor minimum value exists

## 2 Lecture 4.2

### Examples of Quadratic Functions

1. The curve on the surface of the banana as shown in Figure 2 can be described using the equation  $y = x^2 + 2x + 4$ . An ant (shown in blue color in Figure 2) is walking from one

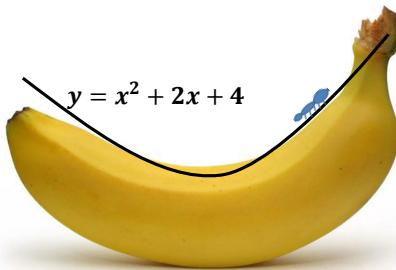


Image source: <https://www.independent.co.uk/food-and-drink/features/>

Figure 2: Path of an ant over the top surface of a banana for Question 4

end of the banana to the other end. What will be the  $x$ -coordinate of the ant's location once it reaches the vertex of its path?

- a 1
  - b 0
  - c -1
  - d 0.5
2. Deb and Ananya bought 20 toys together. From these 20 toys, Deb lost 3 toys and Ananya lost 4 toys. Product of the current number of their toys is 42. Can you form an equation for Deb to know how many toys did he have initially? [Let us assume Deb initially had  $x$  number of toys.]
    - a  $-x^3 + 13x - 4 = 42$
    - b  $19x - 4 = 42$
    - c  $-x^2 + 19x - 48 = 42$
    - d  $x^2 = 42$

3. Represent the following problem in the form of an equation: a medicine manufacturer produces  $y$  number of vaccines every day. The manufacturing cost of each vaccine is ₹100 plus the number of vaccines manufactured on that day. On a particular day, the total manufacturing cost was ₹10,000. How many vaccines were manufactured on that day?
- a  $-y^2 + 13y - 4 = 42$   
b  $19y - 4 = 10000$   
c  $y^2 + 100y = 10000$   
d  $y^2 = 100$
4. Find the vertex and axis of symmetry of the graph of the quadratic function:  $f(x) = x^2 + 4x + 5$
- a vertex= (1,-2), axis of symmetry x=1  
b vertex= (-1,1), axis of symmetry x=2  
c vertex= (-2,1), axis of symmetry x=-2  
d vertex= (0,0), axis of symmetry x=3
5. Ananya runs a shop selling books. The profit she makes from her shop is given by the function  $P(u) = 100 + 40u - 2u^2$ , where  $u$  is the amount that she spends on bookbinding.
- (i) Find the value of  $u$  in order to maximize the profit  $P(u)$ .
- a 10  
b 11  
c 20  
d 15
- (ii) Find the maximum profit obtained by Ananya's shop.
- a 300  
b 400  
c 310  
d 315

### 3 Lecture 4.3

#### Slope of Quadratic Functions

1. Calculate the slope of the parabola at a point  $(x, y)$  obtained by plotting the following function:  $y = x^2 + 2x + 4$ 
  - a  $2x+2$
  - b  $+2x$
  - c  $-1.5x$
  - d  $0.5$
2. Calculate the slope of the parabola at a point  $(x, y)$  obtained by plotting the following function:  $y = -5x^2 + 10x + 10$ 
  - a  $-10x+10$
  - b  $-10x$
  - c  $10x$
  - d  $9.8$
3. Calculate the slope of the parabola given by the following function:  $y = 6x^2 + 10x + 15$  at the point  $(2, y)$ .
  - a  $34$
  - b  $-10x+10$
  - c  $10x$
  - d  $21$

## 4 Lecture 4.4

### Solution of Quadratic Equation by Graph

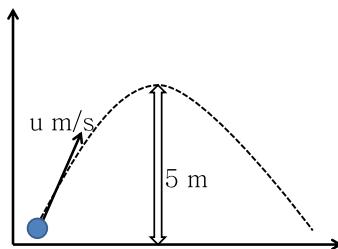


Figure 3: Diagram for Lecture-4.4 Question 1: Stone thrown in air at maximum height 5 metre

1. A stone is thrown with an initial speed  $u$  (m/s) as shown in figure 3. The height of the stone's trajectory above the ground is,  $H(t) = -5t^2 + \frac{1}{2}ut$  (here  $t$  is the time of flight). If the highest point in air that the stone can reach is 5m above the ground, then calculate the initial speed  $u$ .
  - a 20 m/s
  - b 10 m/s
  - c 12 m/s
  - d 2 m/s
2. Find the roots of the equation:  $x^2 - 8x + 15 = 0$ 
  - a Two real roots 3, 5
  - b Two real roots 4, 15
  - c One real root -1
  - d One real root 3
3. Find the roots of the equation:  $x^2 - 2x + 1 = 0$ 
  - a One repeated, real root 1
  - b Two real roots 6, 7
  - c One real root -5
  - d One real root 3

**BSCMA1001: Activity Questions**  
**Week-5**  
**Solution of Quadratic Equations**

## Contents

<b>1</b>	<b>Lecture-27</b>	<b>2</b>
I	Multiple Choice Questions (MCQ): . . . . .	2
II	Multiple Select Questions (MSQ): . . . . .	2
<b>2</b>	<b>Lecture-28</b>	<b>4</b>
I	Multiple Choice Questions (MCQ): . . . . .	4
II	Multiple Select Questions (MSQ): . . . . .	4
<b>3</b>	<b>Lecture-29</b>	<b>5</b>
I	Multiple Choice Questions (MCQ): . . . . .	5
II	Multiple Select Questions (MSQ): . . . . .	5

# 1 Lecture-27

## I Multiple Choice Questions (MCQ):

1. Choose the correct standard form of a quadratic equation with roots  $\frac{7}{2}$  and  $-\frac{10}{3}$ .
  - a  $6x^2 - x - 70 = 0$
  - b  $\frac{1}{3}(6x^2 - x - 70) = 0$
  - c  $\frac{1}{6}(6x^2 - x - 7) = 0$
  - d  $(x - \frac{7}{2})(x + \frac{10}{3}) = 0$
2. Choose the correct option about  $a$  with the help of Figure AQ-5.1.

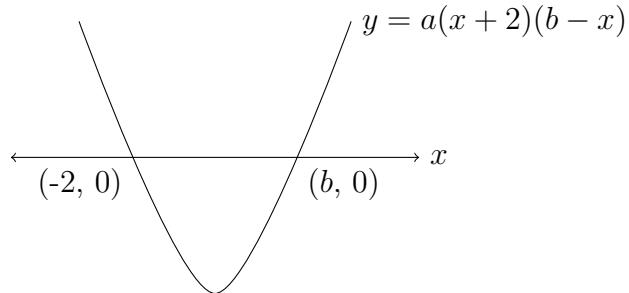


Figure AQ-5.1

- a  $a > 0$
- b  $a = 5$
- c  $a = 0$
- d  $a < 0$

## II Multiple Select Questions (MSQ):

1. Choose the set of correct options regarding quadratic functions  $p(x) = x^2 - 7x + 10$  and  $q(x) = x^2 + 7x + 10$ .
  - a  $p(x)$  has two roots -5 and -2.
  - b  $p(x)$  has two roots 5 and 2.
  - c  $q(x)$  has two roots 5 and 2.
  - d  $q(x)$  has two roots -5 and -2.
2. Identify the incorrect options for the quadratic equation  $x^2 - 15x + 54 = 0$ .

- a 9 is a root.
- b Both the roots are equal.
- c There are no roots.
- d 6 is a root.

## 2 Lecture-28

### I Multiple Choice Questions (MCQ):

1. What should be added in  $p(x)$  to make it perfect square, if  $p(x) = x^2 - 12x + 34$ ?
  - a 1
  - b 2
  - c 3
  - d 4
2. Choose the correct option regarding equation  $x^2 - 12x + 37 = 0$ .
  - a Can be solved using the prime factorization method.
  - b 1 is a root.
  - c Can not be solved by completing the square method.
  - d 0 is a root.

### II Multiple Select Questions (MSQ):

1. Which of the following is/are true, if  $x^2 - 8x + 13 = 0$  is solved by completing square method.
  - a 3 should be added on both sides of equation.
  - b  $4 + \sqrt{3}$  is one of the roots.
  - c  $4 - \sqrt{3}$  is one of the roots.
  - d Equal roots.

### 3 Lecture-29

#### I Multiple Choice Questions (MCQ):

1. The quadratic equation  $9x^2 + 6x + 1 = 0$  has-
  - a Two distinct roots.
  - b Equal roots.
  - c No roots.
  - d Inadequate information.
2. If two different quadratic equations have same discriminant then choose the correct option.
  - a The roots of both equation will always be same.
  - b The roots of both equation will always be real.
  - c The roots of both equation will always be distinct.
  - d Discriminant can not determine the relation between the roots of two different equations.
3. What will the roots of equation  $2x^2 - x - 10 = 0$  be?
  - a Cannot be determined
  - b 2 and  $\frac{5}{2}$
  - c -2 and  $\frac{5}{2}$
  - d 2 and  $-\frac{5}{2}$

#### II Multiple Select Questions (MSQ):

1. Which of the following gives distinct real roots?
  - a  $69x^2 - 42x - 56 = 0$
  - b  $69x^2 - 10x + 560 = 0$
  - c  $9x^2 - 10x + 1 = 0$
  - d  $9x^2 - 10x - 1 = 0$
2. Nature of roots of quadratic equation  $x^2 - 4x + 7 = 0$  can be determined by-
  - a Completing the square method.
  - b Qudratic formula.
  - c Graphical method.
  - d None of the above methods.

**BSCMA1001: Activity Questions**  
**Week-6**

## Contents

<b>1 Lecture-6.1</b>	<b>2</b>
I    Multiple Select Questions (MSQ): . . . . .	2
<b>2 Lecture-6.2</b>	<b>3</b>
I    Multiple Choice Questions (MCQ): . . . . .	3
II    Multiple Select Questions (MSQ): . . . . .	3
<b>3 Lecture-6.3</b>	<b>5</b>
I    Multiple Choice Questions (MCQ): . . . . .	5
II    Multiple Select Questions (MSQ): . . . . .	5
<b>4 Lecture-6.4</b>	<b>7</b>
I    Multiple Choice Questions (MCQ): . . . . .	7
II    Multiple Select Questions (MSQ): . . . . .	7
<b>5 Lecture-6.5</b>	<b>8</b>
I    Multiple Choice Questions (MCQ): . . . . .	8
II    Multiple Select Questions (MSQ): . . . . .	8
<b>6 Lecture-6.6</b>	<b>9</b>
I    Multiple Choice Questions (MCQ): . . . . .	9
II    Multiple Select Questions (MSQ): . . . . .	9

# 1 Lecture-6.1

## I Multiple Select Questions (MSQ):

1. Which of the following statements is(are) correct with respect to the polynomials?
  - a A polynomial with one, two, and three terms are called binomial, trinomial and monomial respectively.
  - b A polynomial is an algebraic expression in which the only arithmetic is addition, subtraction, multiplication and non-negative integer exponents of the variables.
  - c A polynomial in one variable can be represented as:  $\sum_{m=0}^n a_m x^m$  where  $m$  and  $n$  are natural numbers.
  - d  $t^{5/2} + t$ , is a binomial.
  - e  $\sqrt{(x - 1)^2}$ , is a binomial.
  - f  $\sqrt{x - 1}$ , is a binomial.
2. From the list of algebraic expressions  $x + \sqrt{\frac{1}{2}}$ ,  $\sqrt{\frac{x}{2}} - 2x^2 \times x^8$ ,  $\sqrt{\frac{x^2}{2}}$ , 0.001,  $\frac{x^3+5x^2-8x}{x^2}$ ,  $5x^{111} + x^{-9}$ ,  $8 \times x^2 + (-3)$  choose the correct option(s) from the following.
  - a Total number of monomials are 2
  - b Total number of binomials are 2
  - c Total number of polynomials are 4
  - d  $\frac{x^3+5x^2-8x}{x^2}$  is a trinomial.
  - e  $5x^{111} + x^{-9}$  is a binomial.

## 2 Lecture-6.2

### I Multiple Choice Questions (MCQ):

1. The degree of the 3<sup>rd</sup> term of a polynomial  $5x^6 - 4x^5 + x^{0.5} - x^1 + 4$  is
  - a  $\frac{1}{2}$  or 0.5
  - b It is not a polynomial.
  - c 6
  - d 13.5
  - e 0
2. The degree of a polynomial  $\sqrt{x^8} + \frac{5}{2}x^3 - \sqrt{2}$ 
  - a It is not a polynomial.
  - b 3
  - c 8
  - d 4
3. The degree of zero polynomial is
  - a 0
  - b Can be a positive real number.
  - c 1
  - d Not defined.

### II Multiple Select Questions (MSQ):

1. Choose the correct options.
  - a The degree of the polynomial is the largest degree of any one of the terms with or without zero coefficients.
  - b Degree of any term in a polynomial, is the sum of the degrees of the variables in that term.
  - c Degree of the polynomial  $\sqrt{10x^{10}y^{12}z^8}$  is 15.
  - d The degree of the binomial  $\frac{8x^2 + \sqrt{8x^2}}{\sqrt{5x^2}}$  is 2.
2. Choose the correct options with respect to the polynomials.
  - a The degree of a constant polynomial is 1.
  - b The degree of the binomial,  $\sqrt{2x^4}y + 2y + 0$  is 3.

- c The equation of a straight line is an example of linear polynomial, which is always a binomial.
- d The binomial,  $2x^2 + 0x + \sqrt{2}$  is a quadratic polynomial.
- e The cubic polynomial must be a trinomial.
- f Degree of a cubic monomial,  $x^2yz^0$  is 3

### 3 Lecture-6.3

#### I Multiple Choice Questions (MCQ):

1. Choose the correct option with respect to the domain and range of the polynomial function  $p(x)$ .
  - a Domain and range of  $p(x)$  is  $\mathbb{R}$ .
  - b Domain of  $p(x)$  depends on the function and the range is  $\mathbb{R}$ .
  - c Domain of  $p(x)$  is  $\mathbb{R}$  and the range depends on the function.
  - d Both range and domain of  $p(x)$  depends on the function.
2. The non constant polynomials  $p(x)$  and  $q(x)$  with degree  $m$  and  $n$  respectively, when added the resultant polynomial is  $r(x)$ . Choose the correct option from the following.
  - a If  $m < n$  then the degree of the polynomial  $r(x)$  is  $n$ .
  - b If  $m = n$  then the degree of the polynomial  $r(x)$  is  $m + n$ .
  - c If  $m > n$  then the degree of the polynomial  $r(x)$  is  $n$ .
  - d If  $m < n$  then the degree of the polynomial  $r(x)$  is  $n - m$ .
  - e If  $m > n$  then the degree of the polynomial  $r(x)$  is  $m - n$ .
3. The difference between the cubic polynomial  $p(x) = \sum_{k=0}^3 a_k x^k$  and  $q(x) = \sum_{j=0}^3 b_j x^j$ , using subtraction algorithm is  
(Hint:  $p(x) - q(x) = \sum_{k=0}^{m \vee n} (a_k - b_k) x^k$ ,  $m \vee n$  denotes whichever is maximum )
  - a  $(a_3 - b_3) x^3 + (a_2 - b_2) x^2 + (a_1 - b_1) x^1 + (a_0 - b_0) x^0$
  - b  $(a_3 + b_2) x^1 + (a_2 + b_3) x^1 + (a_1 + b_2) x^3 + (a_0 + b_0) x^0$
  - c  $(a_3 + b_3) x^3 - (a_2 + b_2) x^2 - (a_1 + b_1) x^1 - (a_0 + b_0) x^0$
  - d  $(a_3 - b_3) x^3 - (a_2 - b_2) x^2 - (a_1 - b_1) x^1 - (a_0 - b_0) x^0$

#### II Multiple Select Questions (MSQ):

1. Choose the right option(s) with respect to the polynomials  $p(x) = \sum_{k=0}^n a_k x^k$  and  $q(x) = \sum_{j=0}^m b_j x^j$ .
  - a  $p(x) + q(x) = \sum_{k=0}^{m \vee n} (a_k + b_k) x^k$
  - b  $p(x) + q(x) = \sum_{k=0}^{m \vee n} (a_k + b_k) x^{m+n}$
  - c  $p(x) - q(x) = \sum_{k=0}^{m \vee n} (a_k - b_k) x^{m-n}$
  - d  $p(x) - q(x) = \sum_{k=0}^{m \vee n} (a_k - b_k) x^k$
  - e  $p(x) + q(x) = \sum_{k=0}^{m \vee n} (a_k - b_k) x^k$
  - f  $p(x) - q(x) = \sum_{k=0}^{m \vee n} (a_k + b_k) x^k$

2. Choose the correct option(s) with respect to the polynomial  $p(x) = \sum_{k=0}^n a_k x^k$ , and  $q(x) = \sum_{j=0}^m a_j x^j$ .
- a Sum of two distinct binomials is always binomial.
  - b Difference of two distinct trinomials is always a trinomial.
  - c Sum or difference of a binomial and a trinomial can be a trinomial.
  - d A quadratic trinomial when added to itself the resultant is quadratic trinomial.
  - e A quadratic trinomial when it is subtracted from itself the resultant is quadratic trinomial.

## 4 Lecture-6.4

### I Multiple Choice Questions (MCQ):

1. If the polynomial  $r(x)$  is the product of a degree two polynomial  $p(x) = -8x^2 - 12x + 2$  and its slope then the coefficient of term with highest power is
  - a -128
  - b -8
  - c **128**
  - d 24
  - e -24
2. The product of the polynomials  $p(x) = 2x^2 + 2x + 2$  and  $q(x) = x^2 - x - 1$  is
  - a  $2x^4 + 2x^2 - 4x + 2$
  - b  $4x^4 - 4x^2 - 4x - 4$
  - c  $4x^4 - 4$
  - d  **$2x^4 - 2x^2 - 4x - 2$**

### II Multiple Select Questions (MSQ):

1. Choose the correct option(s) with respect to the product of the polynomials  $p(x) = \sum_{k=0}^n a_k x^k$  and  $q(x) = \sum_{j=0}^m b_j x^j$ .
  - a  $p(x) \times q(x) = \sum_{k=0}^{m+n} \sum_{j=0}^k (a_j b_{k-j}) x^{k-j}$
  - b  $q(x) \times p(x) = \sum_{k=0}^{m+n} \sum_{j=0}^k (a_j b_{k-j}) x^{m+n}$
  - c  **$p(x) \times q(x) = \sum_{k=0}^{m+n} \sum_{j=0}^k (a_j b_{k-j}) x^k$**
  - d  **$q(x) \times p(x) = \sum_{k=0}^{m+n} \sum_{j=0}^k (a_j b_{k-j}) x^k$**
2. If  $r(x) = p(x)q(x)$  where  $p(x) = -2x^9 + 4x^5 + 2x^2 + 1$  and  $q(x) = 8x^4 - 2x^2 + x$  then choose the correct option(s) from the following.
  - a Degree of  $r(x) = 13$  and coefficient of  $x^{13} = -16$ .
  - b Degree of polynomial  $r(x) = 36$  and it has 0 coefficient.
  - c Coefficient of  $x^2$  in  $r(x)$  and  $q(x)$  is -2
  - d Coefficient of  $x^8$  in  $r(x)$  is 0.
  - e Coefficient of  $x^9$  in  $r(x)$  and  $p(x)$  is 32 and -2 respectively.

## 5 Lecture-6.5

### I Multiple Choice Questions (MCQ):

1. If  $p(x) = x^5 - 4x^4 + 3x^3 + 3x^2 - 4$  and  $q(x) = (x - 2)^2$ , then  $\frac{p(x)}{q(x)}$  is
  - a  $x^3 + x + 1$
  - b  $x^4 - x^2 - 1$
  - c  $x^3 - x - 1$
  - d  $x^4 - x^2 + 1$
2. When a polynomial  $q(x) = x^6 + 3x^4 + 3x^3 - 3x^2 - 10$  is divided by another polynomial  $p(x) = (x - 2)^4(x + 2)^3$ , then which of the following is correct?
  - a  $2x^2 - 2x + 5$
  - b Division is not possible.
  - c  $12x^2 - 10x + 10$
  - d None of the above.

### II Multiple Select Questions (MSQ):

1. Which of the following is(are) correct with respect to the division of polynomial if the dividend and the divisor are  $p(x) = \sum_{k=0}^n a_k x^k$  and  $q(x) = \sum_{j=0}^m b_j x^j$  respectively and they are not a constant polynomial?
  - a The division is possible when  $n \geq m$ .
  - b If  $p(x)$  is a trinomial, then the quotient is always a trinomial.
  - c The quotient is always a polynomial.
  - d If  $m = 6$  and  $n = 4$ , then division is possible.

## 6 Lecture-6.6

### I Multiple Choice Questions (MCQ):

1. If dividend is  $p(x) = x^6 - 6x^5 + 17x^4 - 48x^3 + 76x^2 - 24x + 36$  and divisor is  $g(x) = x^2 - 6x + 9$ , then quotient  $q(x)$  and remainder  $r(x)$  will be
  - a  $q(x) = x^4 + 8x^2 + 4$  and  $r(x) = 0$
  - b  $q(x) = x^4 - 8x^2 + 4$  and  $r(x) = x + 1$
  - c  $q(x) = x^4 + 8x^2 + 4$  and  $r(x) = x + 1$
  - d  $q(x) = x^4 + 8x^2 - 4$  and  $r(x) = 0$
2. What will be the dividend  $p(x)$ , if the divisor, the quotient and the remainder are  $g(x) = x^{10} + 2x + 2$ ,  $q(x) = x^4 - 2$  and  $r(x) = 2x - 4$  respectively?
  - a  $p(x) = x^{14} - 2x^{10} + 2x^5 + 2x^4 - 2x + 8$
  - b  $p(x) = x^{14} - 2x^{10} + 2x^5 + 2x^4 - 2x - 8$
  - c  $p(x) = x^{14} - 2x^{10} - 2x^5 + 2x^4 - 2x - 8$
  - d  $p(x) = x^{40} - 2x^{10} + 2x^5 + 2x^4 - 2x - 8$

### II Multiple Select Questions (MSQ):

1. Choose the correct option(s) with respect to the polynomials  $p(x) = x^3 + 2x^2 - 11x - 12$  and  $g(x) = x - 3$ .
  - a The remainder of the division of  $p(x)$  by  $g(x)$  is 0.
  - b The division of  $g(x)$  by  $p(x)$  is not possible.
  - c The remainder of the division of  $g(x)$  by  $p(x)$  is 0.
  - d If  $g_1(x) = x + 4$  and  $g_2(x) = x + 1$  then the remainder  $r(x)$  is 0 when  $p(x)$  is divided by  $g_1(x)$  and  $p(x)$  divided by  $g_2(x)$ .
2. Choose the correct option(s) from the following if  $f(x) = 10x^4 + 17x^3 - 62x^2 + 28x - 18$  and  $g(x) = 2x^2 - x + 1$  are two polynomials and  $r(x)$  and  $q(x)$  represent the remainder and quotient respectively.
  - a Division of  $f(x)$  by  $g(x)$  is not possible.
  - b If  $f(x)$  is divided by  $q_1(x)$ , where  $q_1(x) = 5x^2 + 11x - 28$  then the quotient and remainder will be  $2x^2 - x + 1$  and  $-11x + 10$  respectively.
  - c  $q(x) = 5x^2 + 11x + 28$  and  $r(x) = -11x - 10$  then  $f(x) = g(x) \times q(x) + r(x)$
  - d  $q(x) = 5x^2 + 11x - 28$  and  $r(x) = -11x + 10$  then  $f(x) = g(x) \times q(x) + r(x)$

**BSCCS1001: Activity Questions**  
**Week-7**

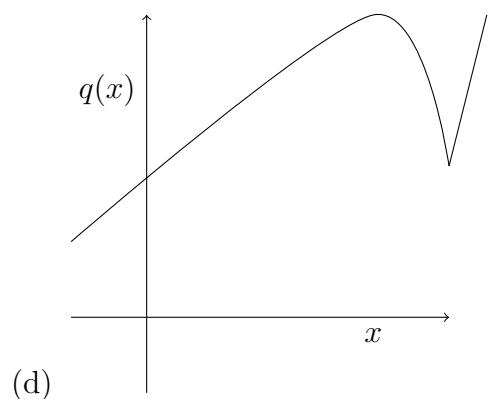
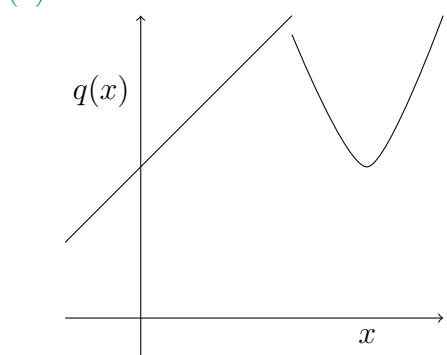
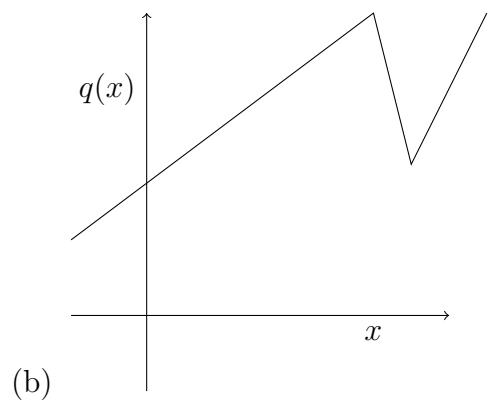
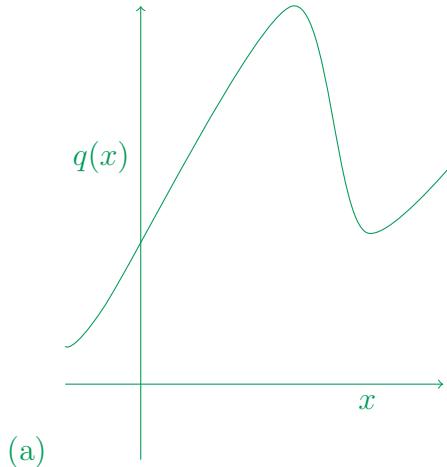
## Contents

<b>1</b>	<b>Lecture -1</b>	<b>2</b>
1.1	Multiple Choice Question(MCQ) . . . . .	2
1.2	Multiple Select Question(MSQ) . . . . .	3
<b>2</b>	<b>Lecture -2</b>	<b>4</b>
2.1	Multiple Choice Question(MCQ) . . . . .	4
2.2	Multiple Select Question(MSQ) . . . . .	4
2.3	Numerical Answer Type . . . . .	5
<b>3</b>	<b>Lecture - 3</b>	<b>6</b>
3.1	Multiple Choice Question(MCQ) . . . . .	6
3.2	Multiple Select Question . . . . .	7
<b>4</b>	<b>Lecture - 4</b>	<b>9</b>
4.1	Multiple Choice Question(MCQ) . . . . .	9
<b>5</b>	<b>Lecture -5</b>	<b>12</b>
5.1	Multiple Choice Question(MCQ) . . . . .	12
5.2	Multiple Selected Question(MSQ) . . . . .	12
<b>6</b>	<b>Lecture - 6</b>	<b>14</b>
6.1	Multiple Choice Question . . . . .	14
6.2	Numerical Answer Type(NAT) . . . . .	15
<b>7</b>	<b>Lecture - 7</b>	<b>16</b>
7.1	Multiple Choice Question(MCQ) . . . . .	16
7.2	Multiple Select Question(MSQ) . . . . .	18
7.3	Numerical Answer Type(NAT) . . . . .	19

# 1 Lecture -1

## 1.1 Multiple Choice Question(MCQ)

1. Which of the following can be a graph of a polynomial?



## 1.2 Multiple Select Question(MSQ)

2. Ram follows a path according to the given graph as in the Figure AQ-7.1 of a polynomial  $q(x)$ . He started his journey from his house and ends his journey to the market. Choose

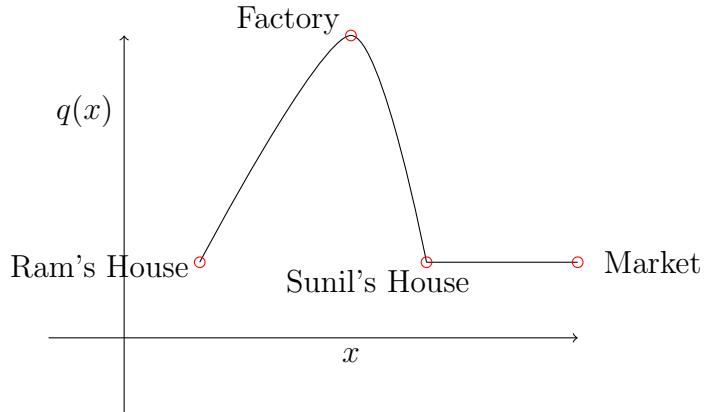


Figure AQ-7.1

the set of correct options

- (a) The path from Ram's House to Sunil's House may represent a graph of a polynomial.
- (b) The whole path may represent a graph of a polynomial.
- (c) The path from factory to market may represent a graph of a polynomial.
- (d) The path from factory to Sunil's House may represent a graph of a polynomials.

## 2 Lecture -2

### 2.1 Multiple Choice Question(MCQ)

1. Let  $p(x) = 5x^3 - 50x^2 + 155x - 150$  be a polynomial and  $(x - 2)$  be a factor of  $p(x)$ . Which of the following is the complete factorized form of the given Polynomial  $p(x)$ ?
- (a)  $(x - 5)(x - 2)(x - 3)$
  - (b)  $5(x - 3)(x - 2)(x - 5)$
  - (c)  $(5x + 25)(x - 2)(x - 3)$
  - (d)  $(5x - 15)(x - 2)(x + 5)$

### 2.2 Multiple Select Question(MSQ)

2. Zeros of the polynomial  $2x^3 - 18x^2 - 24x + 40$  is(are)
- (a) 7
  - (b) 14
  - (c) 10
  - (d) 1
  - (e) 2
  - (f) -2
3. Let  $p(x) = (x^2 + x + 1)(x + 1)x$ , choose the set of correct options.
- (a) The monomial factor of  $p(x)$  is 5.
  - (b) The monomial factor of  $p(x)$  is  $x$ .
  - (c) The binomial factor of  $p(x)$  is  $(x + 1)$
  - (d) The binomial factor of  $p(x)$  is  $(x^2 + x + 1)$
  - (e) The trinomial factor of  $p(x)$  is  $(x^2 + x + 1)$
4. Let  $p(x) = x^3 + 2x^2 + 5x + 10$  be a polynomial and  $S$  be the set of  $x$ -intercepts, choose the set of correct options.
- (a)  $S = \phi$
  - (b)  $5 \in S$
  - (c)  $-2 \in S$
  - (d)  $-5 \in S$
  - (e)  $2 \in S$
  - (f) The cardinality of the set  $S$  is 1.
  - (g) The cardinality of the set  $S$  is 3.

## 2.3 Numerical Answer Type

5. let  $p(x) = (x^2 + 5)(x^2 + 4)$  be a polynomial and  $S$  is the set of  $x$ - intercepts and  $R$  is the set of  $y$ -intercepts. Answer the following questions.

(a) Find the cardinality of the set  $S$ .

Ans: 0

(b) Find the  $y$ - intercept.

Ans: 20

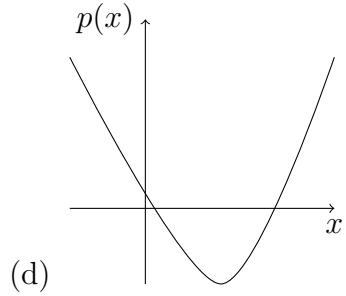
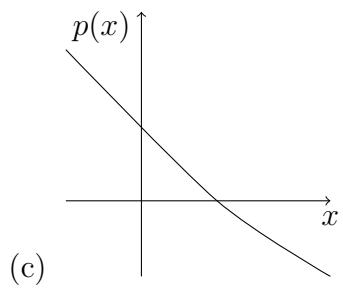
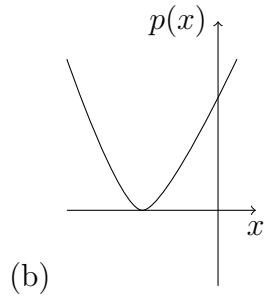
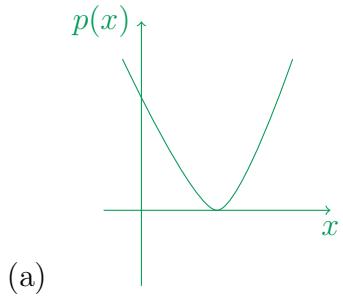
(c) Find the cardinality of the set  $R$ .

Ans: 1

### 3 Lecture - 3

#### 3.1 Multiple Choice Question(MCQ)

1. If  $p(x)$  be a polynomial function and 1 is a zeros of the given polynomial with even multiplicity then which of the following graph is the best representation of the graph of  $p(x)$



### 3.2 Multiple Select Question

Answer Questions 2 and 3 from the Figure AQ-7.2 which represents a graph of a polynomial  $p(x)$ .

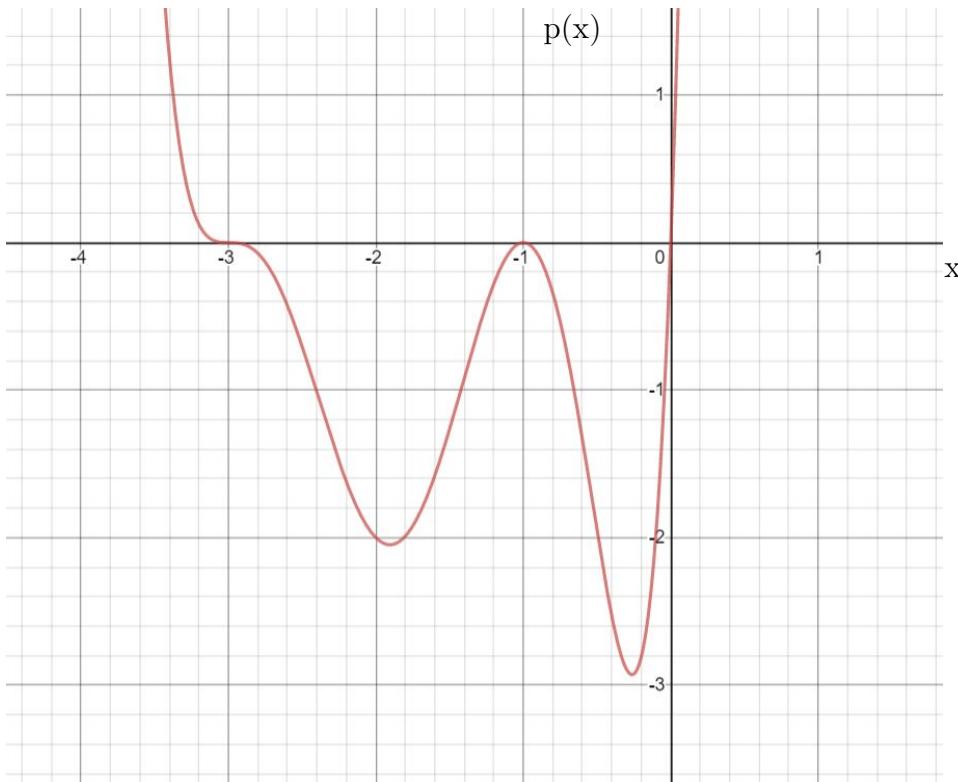


Figure AQ-7.2

2. Choose the set of correct options.
  - (a) Zeros of the polynomial are -3, -2, 1
  - (b) **Zeros of the polynomial are -3, -1, 0**
  - (c)  $y$ -intercept of the polynomial is 1
  - (d)  **$y$ -intercept of the polynomial is 0**
3. Choose the correct options regarding the multiplicities of the zeros
  - (a) -3 with even multiplicity.
  - (b) **-3 with odd multiplicity.**
  - (c) 0 with even multiplicity.
  - (d) **0 with 1 multiplicity.**
  - (e) **-1 with even multiplicity.**

- (f) -1 with odd multiplicity.
4. Let  $p(x)$  be a polynomial and 7, 9, 2 are the only zeros of the polynomial with multiplicities 3, 1, 4 respectively. Then the degree of the polynomial can be at least
- (a) 7
  - (b) 3
  - (c) 8
  - (d) 1
  - (e) 4
5. Suppose  $p(x) = (x + 4)^5(2x^2 + 4)$ , choose the set of correct options.
- (a) 4 is the zero of the polynomial
  - (b) -4 is the zero of the polynomial
  - (c) Only one root is of multiplicity 5
  - (d) Two roots are of multiplicity 5
  - (e) There is no real root
  - (f) The number of real roots is 2
  - (g) The number of real roots is 1

## 4 Lecture - 4

### 4.1 Multiple Choice Question(MCQ)

Answer Questions 1 and 2 from the Figure AQ-7.3 which represents a graph of a polynomial of degree 9.

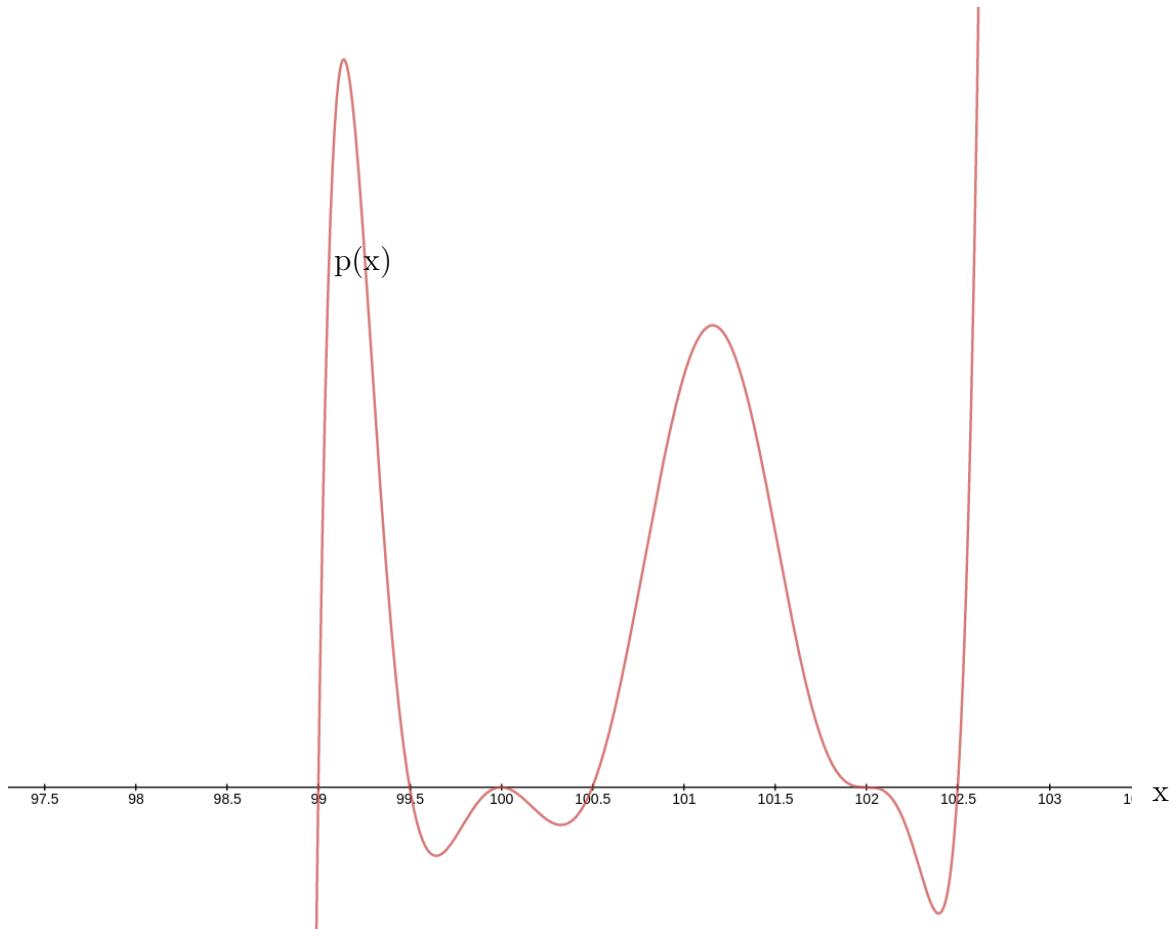


Figure AQ-7.3

1. The zero of polynomials are
  - (a) 100, 99, 101, 99.5, 98, 100.5, 102.5
  - (b) 100, 101, 99, 99.5, 100.5, 102.5, 102
  - (c) 100, 99, 101, 99.5, 98, 100.5, 102.5, 99
  - (d) 100, 99, 99.5, 102, 100.5, 102.5
2. The most appropriate algebraic expression corresponding to the given graph of the polynomial is

- (a)  $5(x - 100)^2(x - 99)(x - 102)^2(x - 100.5)(x - 102.5)(x - 99.5)$
- (b)  $a(x - 100)^2(x - 99)(x - 102)^3(x - 100.5)(x - 102.5)(x - 99.5)$  where  $a > 0, a \in \mathbb{R}$
- (c)  $(x - 100)^2(x - 102)^2(x - 100.5)(x - 102.5)(x - 99.5)$
- (d)  $b(x - 100)^2(x - 99)(x - 102)^3(x - 100.5)(x - 102.5)$  where  $b \neq 0, b \in \mathbb{R}$
- (e) None of the above

A function  $f(x)$  is said to be even function if  $f(-x) = f(x)$  and said to be odd function if  $f(-x) = -f(x)$ . Use this information to question 3 and 4

3. Let  $f(x)$  be a function whose graph is in figure AQ-7.4. Choose the correct option.

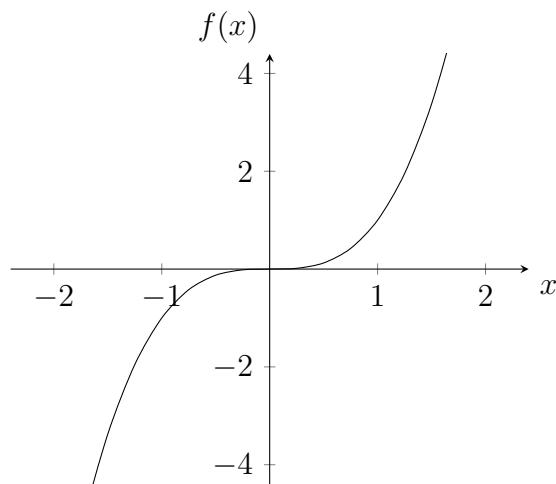


Figure AQ-7.4

- (a)  $f(x)$  is an even function.
- (b)  $f(x)$  is an odd function.
- (c)  $f(x)$  is neither even nor odd function.
- (d)  $f(x)$  is both even and odd function.

4. Let  $f(x)$  be a function whose graph is in figure AQ-7.5. Choose the correct option.

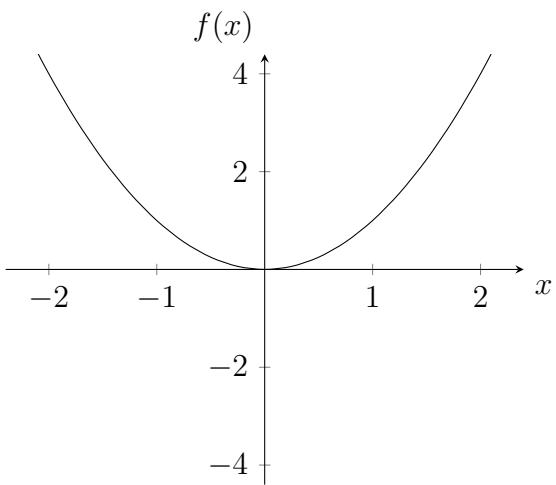


Figure AQ-7.5

- (a)  $f(x)$  is an even function.
- (b)  $f(x)$  is an odd function.
- (c)  $f(x)$  is neither even nor odd function.
- (d)  $f(x)$  is both even and odd function.

## 5 Lecture -5

### 5.1 Multiple Choice Question(MCQ)

1. If  $p(x) = a_nx^n + a_{n-1}x^{n-1} + \dots + a_1x + a_0$  be a polynomial then end behavior of the polynomial depends
  - (a) Only on the coefficient  $a_{n-1}$ .
  - (b) Only on the coefficients  $a_n$  and  $a_{n-1}$ .
  - (c) Only on the coefficient  $a_n$  and the degree of the polynomial.
  - (d) Only on the degree of the polynomial.
  - (e) On all coefficients in the polynomial.
  - (f) On all coefficients and degree of the polynomial.

### 5.2 Multiple Selected Question(MSQ)

Let  $p(x) = a_nx^n + a_{n-1}x^{n-1} + \dots + a_1x + a_0$  be a polynomial. Answer the question 2 to 5

2. If  $a_n > 0$  and  $n$  is even, then which of the following is(are) true?
  - (a)  $x \rightarrow \infty \implies p(x) \rightarrow -\infty$
  - (b)  $x \rightarrow \infty \implies p(x) \rightarrow \infty$
  - (c)  $x \rightarrow -\infty \implies p(x) \rightarrow -\infty$
  - (d)  $x \rightarrow -\infty \implies p(x) \rightarrow \infty$
3. If  $a_n > 0$  and  $n$  is odd, then which of the following is(are) true?
  - (a)  $x \rightarrow \infty \implies p(x) \rightarrow -\infty$
  - (b)  $x \rightarrow \infty \implies p(x) \rightarrow \infty$
  - (c)  $x \rightarrow -\infty \implies p(x) \rightarrow -\infty$
  - (d)  $x \rightarrow -\infty \implies p(x) \rightarrow \infty$
4. If  $a_n < 0$  and  $n$  is odd, then which of the following is(are) true?
  - (a)  $x \rightarrow \infty \implies p(x) \rightarrow -\infty$
  - (b)  $x \rightarrow \infty \implies p(x) \rightarrow \infty$
  - (c)  $x \rightarrow -\infty \implies p(x) \rightarrow -\infty$
  - (d)  $x \rightarrow -\infty \implies p(x) \rightarrow \infty$
5. If  $a_n < 0$  and  $n$  is even, then which of the following is(are) true?

- (a)  $x \rightarrow \infty \implies p(x) \rightarrow -\infty$   
(b)  $x \rightarrow \infty \implies p(x) \rightarrow \infty$   
(c)  $x \rightarrow -\infty \implies p(x) \rightarrow -\infty$   
(d)  $x \rightarrow -\infty \implies p(x) \rightarrow \infty$
6. If  $p(x) = (-5)^3x^3 + 2x^2 + x + 1$  be a polynomial, then which of the following is(are) true?
- (a)  $x \rightarrow \infty \implies p(x) \rightarrow -\infty$   
(b)  $x \rightarrow \infty \implies p(x) \rightarrow \infty$   
(c)  $x \rightarrow -\infty \implies p(x) \rightarrow -\infty$   
(d)  $x \rightarrow -\infty \implies p(x) \rightarrow \infty$
7. If  $p(x) = 7x^n + 9x^5 + 1$  be a polynomial and  $x \rightarrow -\infty \implies p(x) \rightarrow -\infty$ , then which of the following is(are) true?
- (a)  $n > 5$  is even  
(b)  $n > 5$  is odd  
(c)  $n$  is irrational  
(d)  $n = 0$

## 6 Lecture - 6

### 6.1 Multiple Choice Question

1. If  $p(x) = 3x^{10} + 5x + 2$  be a polynomial then the maximum number of turning points of the polynomial  $p(x)$  can be
  - (a) 10
  - (b) 1
  - (c) 9
  - (d) 0
2. If the graph of a polynomial  $p(x)$  is shown in the Figure AQ -7.6 then the number of turning points of the polynomial  $p(x)$  is

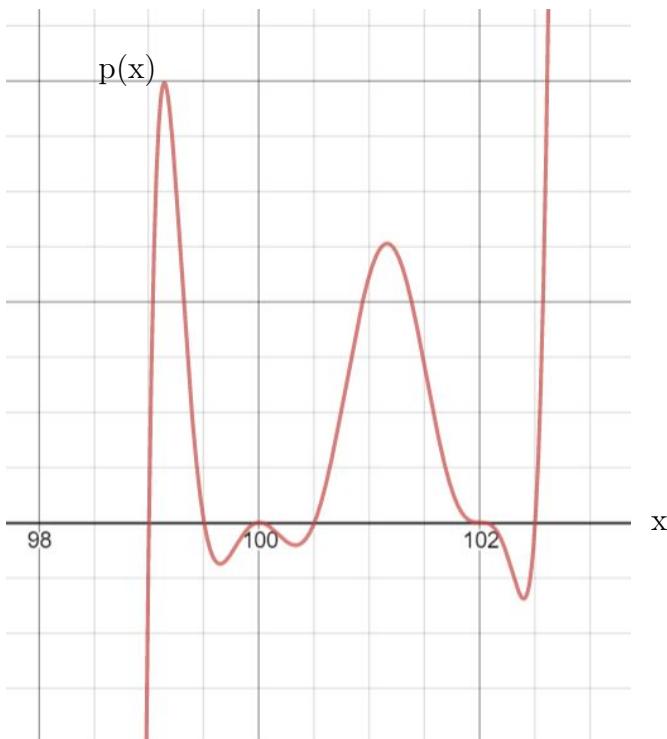


Figure AQ -7.6

- (a) 7
- (b) 6
- (c) 9
- (d) 0
- (e) 5

(f) 8

3. If the graph of a polynomial  $p(x)$  is shown in the Figure AQ - 7.7 then the minimum possible degree of the polynomial  $p(x)$  is

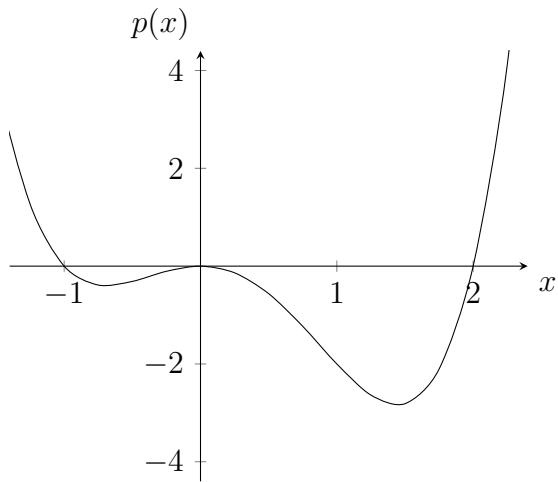


Figure AQ - 7.7

- (a) 3
- (b) 4
- (c) 2
- (d) 1

## 6.2 Numerical Answer Type(NAT)

4. Find the number of turning points of the polynomial  $P(x) = x^3$ .

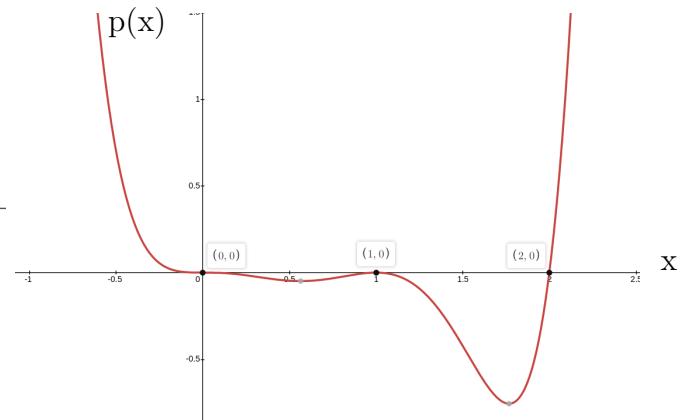
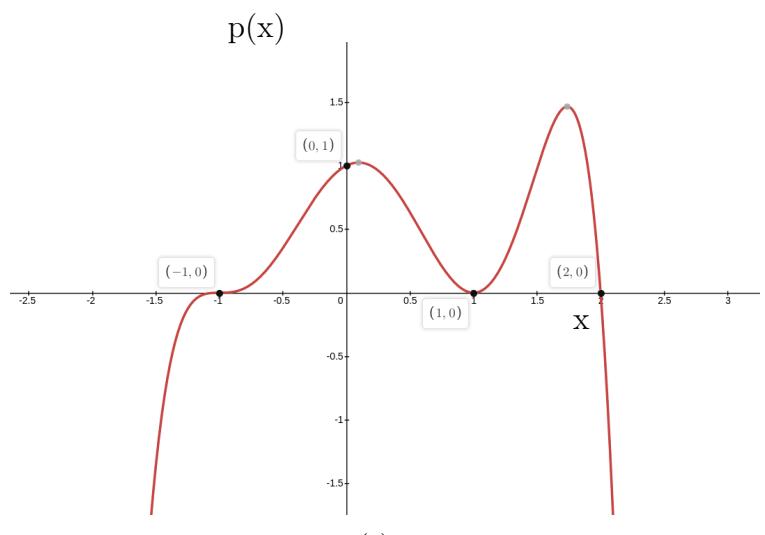
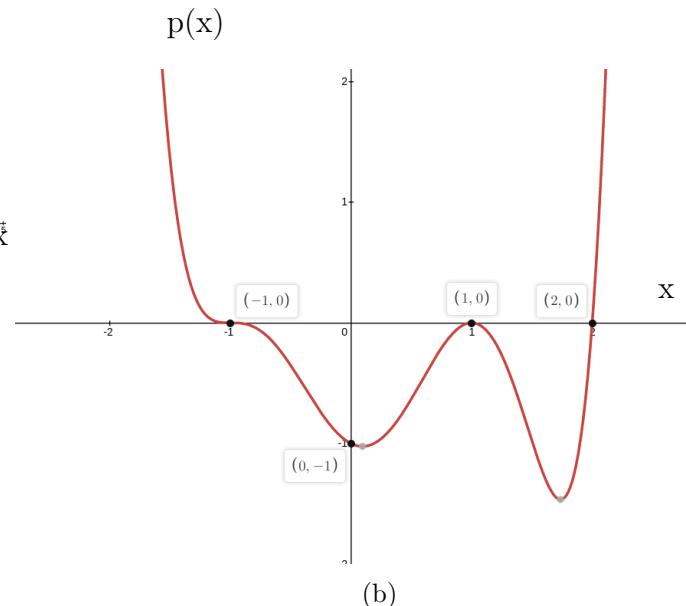
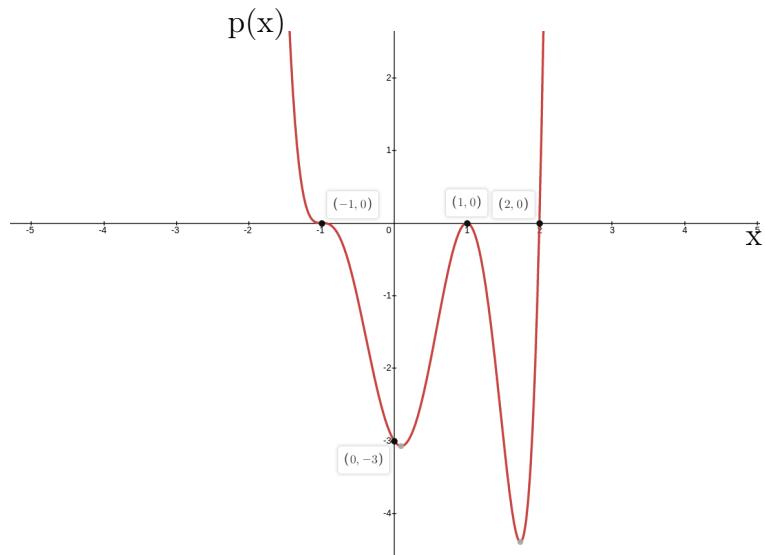
**Answer:** 0

## 7 Lecture - 7

### 7.1 Multiple Choice Question(MCQ)

1. Which of the following represents the graph of the polynomial  $p(x) = \frac{1}{2}(x - 1)^2(x + 1)^3(x - 2)$ .

Ans: Option (b)



2. If  $p(x)$  is a polynomial function and  $p(3)$  and  $p(5)$  have opposite signs to each other, then which of the following is true?
- (a) There exists, at least two values  $a$  and  $b$  such that  $3 < a, b < 5$  and  $p(a) = 0$  and  $p(b) = 0$
  - (b) There does not exist any value  $a$  such that  $3 < a < 5$  and  $p(a) = 0$
  - (c) **There exists, at least one value  $a$  such that  $3 < a < 5$  and  $p(a) = 0$**
  - (d) There exists, at least one value  $a$  such that  $3 > a$  and  $p(a) = 0$

3. The algebraic expression for the polynomial of the graph as shown in the Figure AQ-7.8 is

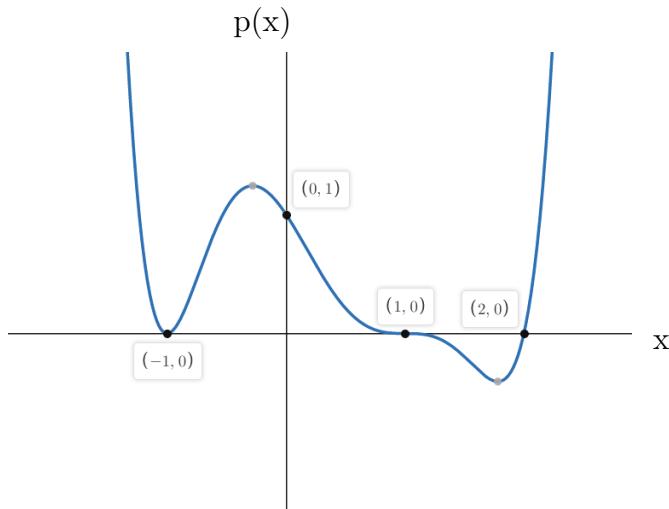


Figure AQ- 7.8

- (a)  $\frac{1}{2}(x - 1)^3(x - 2)(x + 1)^2$
- (b)  $\frac{3}{4}(x - 1)^3(x - 2)(1 + x)^2$
- (c)  $\frac{3}{4}(x - 1)^2(x - 2)(x + 1)$
- (d)  $\frac{1}{2}(x - 1)^3(x - 2)(x + 1)$

## 7.2 Multiple Select Question(MSQ)

4. Given three polynomial are

$$p_1(x) = \sqrt{(-x^2 + x^4)^2}$$

$$p_2(x) = -x^3 + 5x$$

$$p_3(x) = 9x^3 + 7x,$$

choose the set of correct options.

- (a)  $p_1, p_2$  are even polynomials.
- (b)  $p_3$  is an odd polynomial.
- (c)  $p_1$  is an even polynomial.
- (d)  $p_3$  is an even polynomial.
- (e)  $p_1, p_2$  are odd polynomials.

### 7.3 Numerical Answer Type(NAT)

5. Stretch factor of the given graph as in the Figure AQ-7.9 of the polynomial is  
Ans: 2

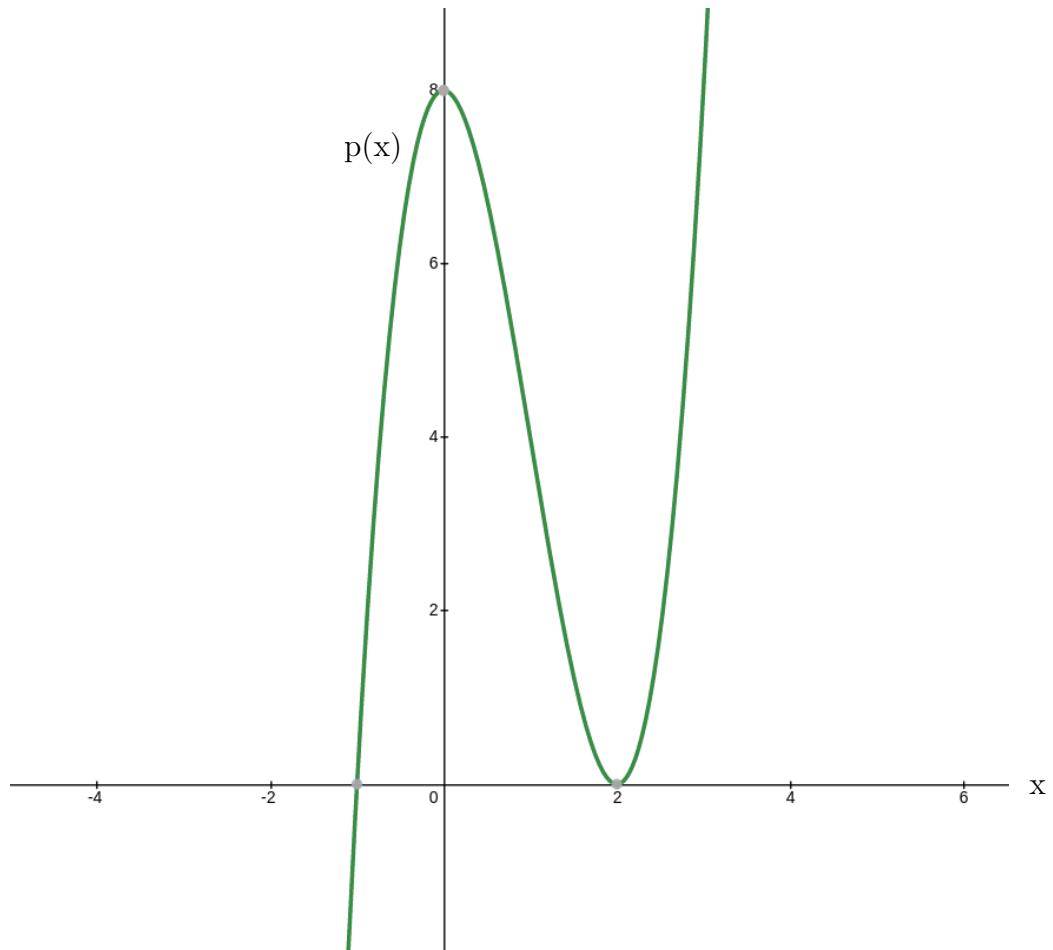


Figure AQ-7.9

**BSCMA1001 : Activity Questions**  
**Week-8**

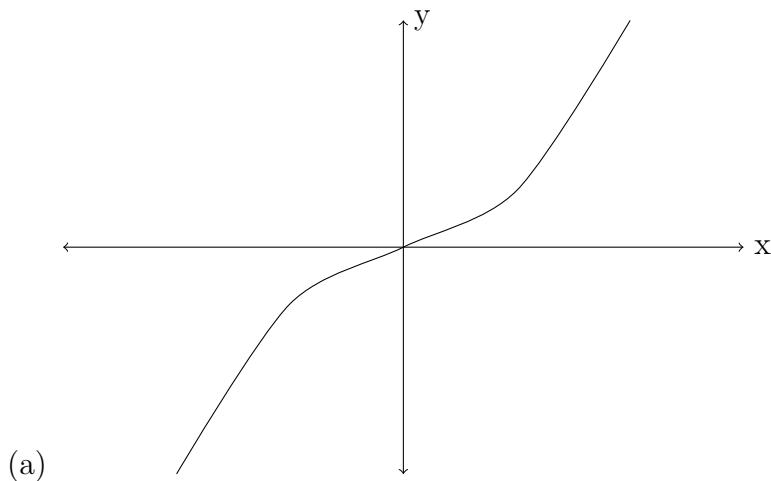
## **Contents**

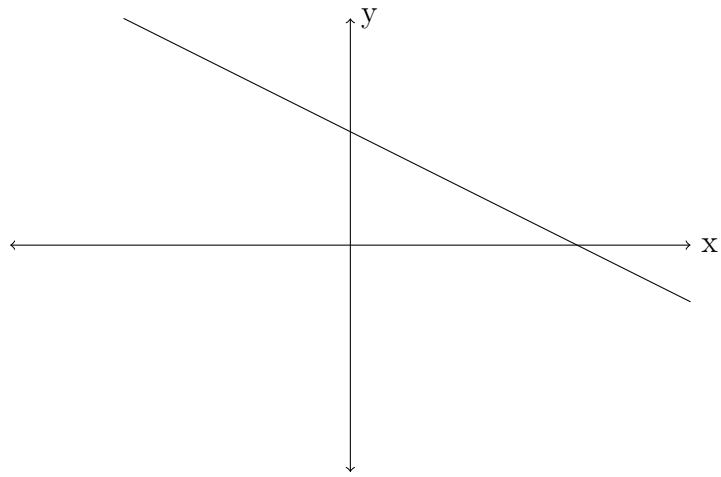
<b>1</b>	<b>Lecture 8.1</b>	<b>2</b>
<b>2</b>	<b>Lecture 8.2</b>	<b>5</b>
<b>3</b>	<b>Lecture 8.3</b>	<b>6</b>
<b>4</b>	<b>Lecture 8.4</b>	<b>7</b>
<b>5</b>	<b>Lecture 8.5</b>	<b>9</b>
<b>6</b>	<b>Lecture 8.6</b>	<b>11</b>
<b>7</b>	<b>Lecture 8.7</b>	<b>12</b>
<b>8</b>	<b>Lecture 8.8</b>	<b>13</b>
<b>9</b>	<b>Lecture 8.9</b>	<b>14</b>

# 1 Lecture 8.1

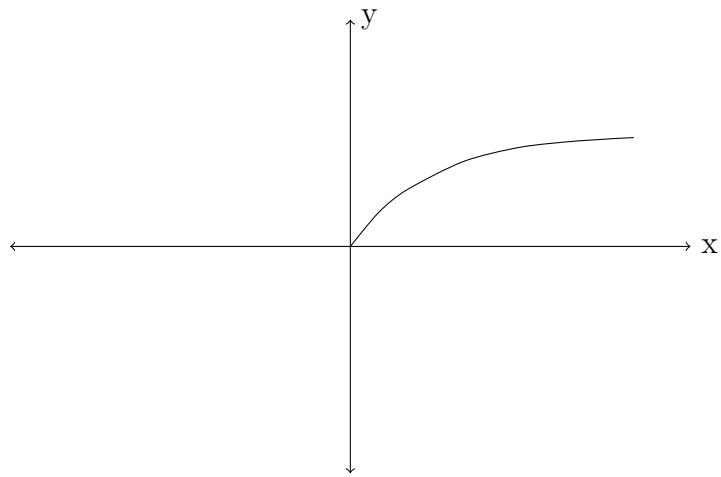
## One to One Function: Definition and Tests

1. Which of the following statements is(are) TRUE?
  - (a) The Vertical line test is used to find whether the given function is one-to-one or not.
  - (b) The Horizontal line test is used to find whether the given function is one-to-one or not.
  - (c) If for one value of  $x$  in domain gives more than one  $f(x)$ , then  $f$  is one-to-one function.
  - (d) If for more than one value of  $x$  in domain gives one  $f(x)$ , then  $f$  is one-to-one function.
2. Which of the following graph fails the Horizontal line test?

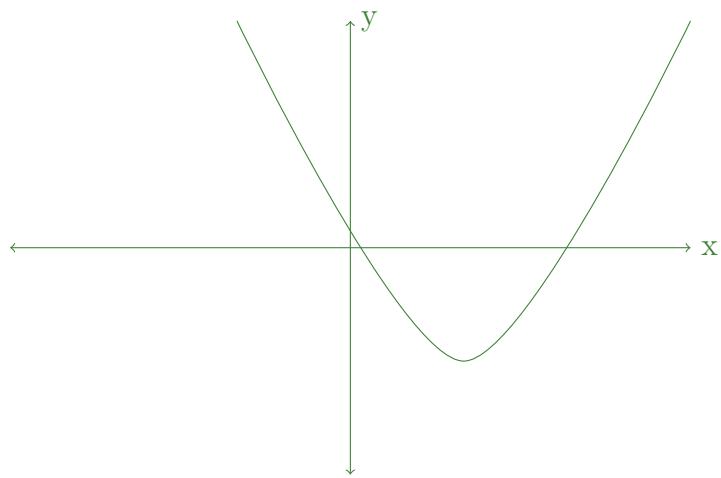




(b)



(c)



(d)

3. Which of the following statements is(are) TRUE?

- (a) One-to-one functions never fail the Horizontal line test.

- (b) One-to-one functions may sometime fail the Horizontal line test.  
(c) No function should fail the Horizontal line test.  
(d) There are some functions that fail the Vertical line test.
4. Which of the following statements is(are) FALSE?
- (a) A function  $f : X \rightarrow Y$  is called one-to-one if,  $f(x_1) = f(x_2) \in Y$ , then  $x_1 = x_2$ .  
(b) One-to-one functions are not always reversible on their range.  
(c) If a function fails the Horizontal line test, then it is not reversible.  
(d) A function  $f : X \rightarrow Y$  is called one-to-one if,  $f(x_1) \neq f(x_2) \in Y$ , then  $x_1 \neq x_2$ .
5. Suppose  $f : [0, \infty) \rightarrow \mathbb{R}$ . Which of the following is not a function?
- (a)  $f(x) = 4x + 3$   
(b)  $f(x) = \pm\sqrt{x+1}$   
(c)  $f(x) = x^2 + 4x + 30$   
(d)  $f(x) = 100$

## 2 Lecture 8.2

### One-to-one Functions: Examples & Theorems

1. Which of the following statements is(are) TRUE?
  - (a) If any horizontal line intersects the graph of a function  $f$  in at most one point, then  $f$  is one-to-one.
  - (b) If any horizontal line intersects the graph of a function  $f$  in at least one point, then  $f$  is one-to-one.
  - (c) If  $f$  is a decreasing function, then  $f$  is not one-to-one.
  - (d) If  $f$  is an increasing function, then  $f$  is one-to-one.
2. If  $f : \mathbb{R} \rightarrow \mathbb{R}$ , then which of the following functions is(are) one-to-one?
  - (a)  $f(x) = |x + 1| - 20$
  - (b)  $f(x) = x^2 + 4x$
  - (c)  $f(x) = x^3 + 15$
  - (d)  $f(x) = x^3 - 5x^2 + 2x + 8$
3. Which of the following functions is(are) decreasing?
  - (a)  $f(x) = 4x^2 + 4x + 1$ , for all  $x \in \mathbb{R}$
  - (b)  $f(x) = 7 - 3x$ , for all  $x \in \mathbb{R}$
  - (c)  $f(x) = -2x^3$ , for all  $x \in \mathbb{R}$
  - (d)  $f(x) = \frac{1}{x}$ , for all  $x \in \mathbb{R} \setminus \{0\}$
4. Which of the following statements is(are) INCORRECT?
  - (a) The function  $f(x) = \frac{4x+3}{3x-5}$ , for all  $x \in \mathbb{R} \setminus \{\frac{5}{3}\}$  is one-to-one.
  - (b) The function  $f(x) = mx + c$ , for all  $x \in \mathbb{R}$  (where  $m \in \mathbb{R} \setminus \{0\}$  and  $c \in \mathbb{R}$ ) is one-to-one .
  - (c) A quadratic function having two distinct roots is always one-to-one.
  - (d) A quadratic function having equal roots can be one-to-one.

### 3 Lecture 8.3

#### Exponential Functions: Definitions

1. Which of the following options is(are) TRUE?
  - (a)  $a^s \times a^t = a^{s+t}$ , for  $s, t \in \mathbb{R}$  and  $a \in \mathbb{R}$
  - (b)  $(a^s)^t = a^{s+t}$ , for  $s, t \in \mathbb{R}$  and  $a > 0$
  - (c)  $(ab)^s = a^s \times b^s$ , for  $s \in \mathbb{R}$  and  $a, b > 0$
  - (d)  $a^s \times b^s = (a+b)^s$ , for  $s \in \mathbb{R}$  and  $a, b > 0$
  - (e)  $a^s \times a^t = a^{s+t}$ , for  $s, t \in \mathbb{R}$  and  $a > 0$ .
2. Which of the following equations is(are) CORRECT?
  - (a)  $2^3 \times 2^4 = 2^{12}$
  - (b)  $2^3 \times 2^4 = 2^7$
  - (c)  $3^5 \times 9^3 = 3^{11}$
  - (d)  $7^3 \times 5^3 = 35^9$
3. Simplify the expression  $(2^2 \times 3^3)^5 \times 4^7 \times 5^3 \times (8 \times 25^3)^2$ 
  - (a)  $60^{15}$
  - (b)  $120^{15}$
  - (c)  $30^{30}$
  - (d)  $30^{15}$
4. Which of the following statements is(are) INCORRECT?
  - (a) Every exponential function is a one-to-one function.
  - (b)  $0^0$  is undefined.
  - (c)  $a^0 = 1$ , for all  $a \in \mathbb{R}$ .
  - (d)  $a$  is the exponent in the algebraic expression  $a^r$ .
5. Which of the following options is not an exponential function?
  - (a)  $f(x) = 3^{x/2}$
  - (b)  $f(x) = x^{\frac{9}{4}}$
  - (c)  $f(x) = \frac{15}{8^x}$
  - (d)  $f(x) = 20 \times 6^x$

## 4 Lecture 8.4

### Exponential Functions: Graphing

1. Suppose  $f : \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 3^x + 20$ . Which of the following is the domain and range of the function  $f$  respectively?
  - (a)  $\mathbb{R}$  and  $(0, \infty)$
  - (b)  $\mathbb{R}$  and  $\mathbb{R}$
  - (c)  $(0, \infty)$  and  $(20, \infty)$
  - (d)  $\mathbb{R}$  and  $(20, \infty)$
2. Suppose  $f : \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2^x - 32$ . Which of the following is(are) true about  $f(x)$ ?
  - (a)  $x$ -intercept is  $(5, 0)$ .
  - (b)  $y$ -intercept is  $(0, -32)$ .
  - (c)  $y = -31$  is the horizontal asymptote.
  - (d)  $y = -32$  is the horizontal asymptote.
3. Which of the following statements is(are) INCORRECT?
  - (a)  $f(x) = 8^{-x}$  is a decreasing function.
  - (b) Every  $f(x) = a^x$ ,  $a > 1$  has same properties as  $g(x) = 6174^x$ .
  - (c)  $f(x) = 20^{-x}$  is an increasing function.
  - (d) Every  $f(x) = a^x$ ,  $a < 1$  has same properties as  $g(x) = 1729^x$ .
4. Suppose  $f : \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = \frac{1}{7^x} + 15$ . Which of the following is true about  $f(x)$ ?
  - (a) End behaviour of  $f(x)$  as  $x \rightarrow \infty$  is 0
  - (b) End behaviour of  $f(x)$  as  $x \rightarrow \infty$  is 15
  - (c) End behaviour of  $f(x)$  as  $x \rightarrow -\infty$  is 15
  - (d) End behaviour of  $f(x)$  as  $x \rightarrow -\infty$  is 0

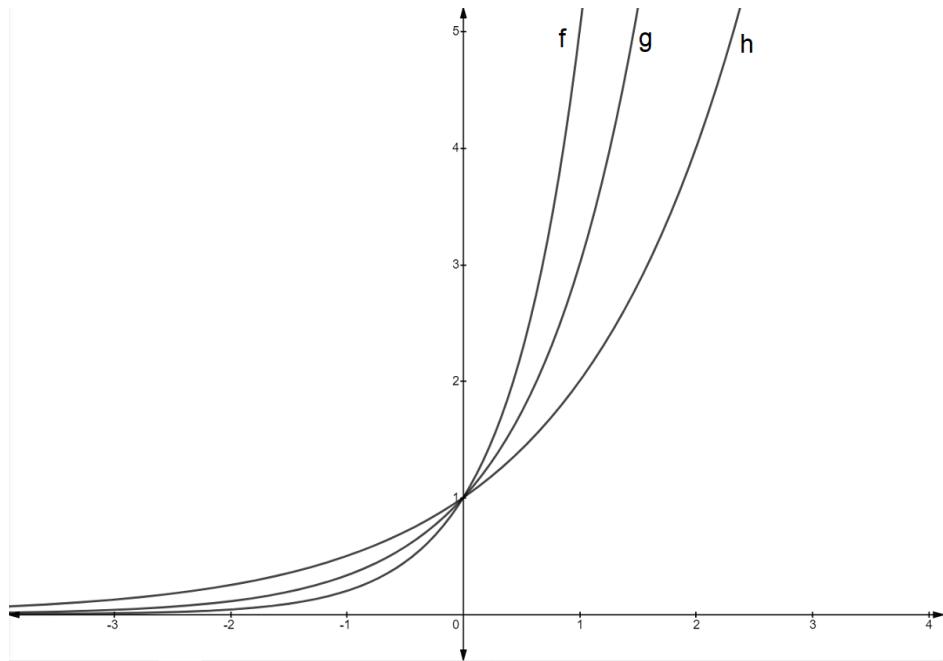


Figure 1

5. Observe Figure 1 and choose the correct set of options:

- (a) The curves  $f, g, h$  may represent  $2^x, 3^x, 5^x$
- (b) The  $y$ -intercepts of  $f, g, h$  are 2,3,5 respectively.
- (c) The curves  $f, g, h$  may represent  $5^x, 3^x, 2^x$ .
- (d) The  $x$ -intercepts of  $f, g, h$  are 1,1,1 respectively.

## 5 Lecture 8.5

Natural Exponential Function:

1. Suppose that a stock's price continues to increase at the rate of 5% per year. If the value of one share of this stock is ₹1000 at present, then find the value(in ₹) of one share of this stock two years from now.  
(Use the formula  $S = a(1 + r)^n$ , where  $r$  is the increase rate per year,  $n$  is the number of years from now,  $a$  is the present value of one share of the stock, and  $S$  is the value of one share of the stock after  $n$  years from now.)
  - (a) 1157.625
  - (b) 1000
  - (c) 1050
  - (d) 1102.5
2. Which of the following options yield the value ' $e$ '?
  - (a) The slope of the tangent line of the curve  $f(x) = e^x$  at  $x = 1$
  - (b) The slope of the tangent line of the curve  $f(x) = x^2 + ex$  at  $x = 1$
  - (c) The area under the curve  $f(x) = 2e^x$ , from  $(-\infty, 1)$
  - (d) The area under the curve  $f(x) = e^x$  from  $(-\infty, 1)$
3. Which of the following statements is(are) CORRECT?
  - (a) If  $n \rightarrow \infty$ , then  $(1 + \frac{1}{n})^n \rightarrow \infty$
  - (b) If  $n \rightarrow \infty$ , then  $(1 + \frac{1}{n})^n \rightarrow e$
  - (c) Every  $f(x) = a^x$ ,  $a < 1$  has same properties as  $g(x) = e^x$ .
  - (d) Every  $f(x) = a^x$ ,  $a > 1$  has same properties as  $g(x) = e^x$ .
4. In 1990, the population of blue whales in the world is approximately 3200. Let  $F(t)$  be the approximate population of blue whales in the world after  $t$  years since 1990( $t = 0$  corresponds to 1990), defined as  $F(t) = 3200e^{-0.15t}$ . What is the approximate population of blue whales in the world in the year 2020?
  - (a) 360
  - (b) 36
  - (c) 12
  - (d) 160

5. In 1990, the population of blue whales in the world is approximately 3200. Let  $F(t)$  be the approximate population of blue whales in the world after  $t$  years from 1990( $t = 0$  corresponds to 1990), defined as  $F(t) = 3200e^{-0.15t}$ . In which year will the population of blue whales approximately be 160? (HINT: Check from the given options)
- (a) 2000
  - (b) 2005
  - (c) 2010
  - (d) 2020
6. Suppose the population of bacteria in a culture is growing exponentially. At today 2:00 pm, 100 bacteria were present and by 5:00 pm, 448 bacteria were present. Find an exponential function  $y = ae^{kt}$  that models this growth, where  $t$  is the number of hours since 2:00 pm( $t = 0$  corresponds to 2:00 pm),  $y$  is the population of bacteria at  $t$  hours, and  $a, k$  are arbitrary constants.(HINT: Check from the given options)
- (a)  $y = 100e^{0.5t}$
  - (b)  $y = 448e^{0.5t}$
  - (c)  $y = 100e^{2t}$
  - (d)  $y = 448e^{2t}$

## 6 Lecture 8.6

Composite Functions:

1. Let  $f(x)$  and  $g(x)$  be two functions. Which of the following options is(are) INCORRECT?
  - (a)  $(f \circ g)(x) = f(g(x))$
  - (b)  $(g \circ f)(x) = g(f(x))$
  - (c)  $(f \circ g)(x) = g(f(x))$
  - (d)  $(g \circ f)(x) = f(g(x))$
2. Suppose  $f(x)$  and  $g(x)$  are well defined functions. Which of the following statements is(are) CORRECT?
  - (a) For any given functions  $f(x)$  and  $g(x)$ ,  $(f \circ g)(x) = (g \circ f)(x)$ .
  - (b) The domain of a composite function  $(f \circ g)(x)$  is always a subset of the domain of the function  $g(x)$ .
  - (c) The domain of a composite function  $(f \circ g)(x)$  is always equal to the domain of the function  $g(x)$ .
  - (d) The range of a composite function  $(f \circ g)(x)$  is always a subset of the range of the function  $f(x)$ .
3. Suppose  $f(x) = 8x$ ,  $g(x) = 50 - 8x$ ,  $h(x) = 50$ , and  $k(x) = 50 - 64x$  are functions. Which of the following options is true?
  - (a)  $(f \circ g)(x) = k(x)$
  - (b)  $(g \circ f)(x) = k(x)$
  - (c)  $(g \circ f)(x) = h(x)$
  - (d)  $(f \circ g)(x) = h(x)$

## 7 Lecture 8.7

### Composite Functions: Examples

1. If  $f(x) = 10(x - 5)^2 + 100x - 225$  and  $g(x) = \sqrt{2x + 5}$ , then the composite functions  $f(g(x))$  and  $g(f(x))$  are respectively
  - (a)  $20x + 75$  and  $\sqrt{20x^2 + 5}$
  - (b)  $\sqrt{20x + 55}$  and  $20x^2 + 25$
  - (c)  $20x + 75$  and  $\sqrt{20x + 55}$
  - (d)  $20x + 75$  and  $\sqrt{20x^2 + 55}$
2. Suppose  $f(x) = 3x + 10$  and  $g(x) = \sqrt{x + 11}$  are two functions. Find the value of  $f(g(5))$ .  
ANSWER: 22
3. Suppose  $f(x) = 3x + 10$  and  $g(x) = \sqrt{x + 11}$  are two functions. Find the value of  $g(f(5))$ .  
ANSWER: 6
4. Which of the following pairs of functions  $f(x)$  and  $g(x)$  satisfies the equation  $f(g(x)) = g(f(x))$ ?
  - (a)  $f(x) = 2x$  and  $g(x) = 10x + 3$
  - (b)  $f(x) = 7x + 6$  and  $g(x) = 4x + 3$
  - (c)  $f(x) = e^x$  and  $g(x) = x$
  - (d)  $f(x) = 4e^x$  and  $g(x) = 4x$
5. If  $f(x) = 2\sqrt{x + 9}$ ,  $g(x) = 8x^2$ , and  $h(x) = 5x + 7$ , then which of the following options are CORRECT?
  - (a)  $f(g(0)) < g(f(0))$
  - (b)  $h(f(0)) > f(h(0))$
  - (c)  $f(g(x)) < g(f(x))$ , for all  $x \in (-\infty, +\infty)$
  - (d)  $f(h(x)) < h(f(x))$ , for all  $x \in [0, +\infty)$
  - (e)  $h(g(1)) > g(h(1))$

## 8 Lecture 8.8

### Composite Functions: Domain

1. If  $f(x) = \frac{x+5}{x-4}$  and  $g(x) = \frac{1}{x+1}$ , then find  $(f \circ g)(x)$ .
  - (a)  $\frac{x-4}{2x+1}$
  - (b)  $\frac{2x+1}{x-4}$
  - (c)  $\frac{-5x-6}{4x+3}$
  - (d)  $\frac{5x+6}{4x-3}$
2. If  $f(x) = \frac{x+5}{x-4}$  and  $g(x) = \frac{1}{x+1}$ , then find the domain of the function  $(f \circ g)(x)$ .
  - (a)  $\mathbb{R} \setminus \{\frac{-3}{4}\}$
  - (b)  $\mathbb{R} \setminus \{-1, \frac{-3}{4}\}$
  - (c)  $\mathbb{R} \setminus \{-1, \frac{-3}{4}, 4\}$
  - (d)  $\mathbb{R} \setminus \{-1, \frac{3}{4}, 4\}$
3. Which of the following statements is(are) CORRECT?
  - (a) If there exists  $x \in \mathbb{R}$  that is not in the domain of a function  $f$ , then that  $x$  will not be in the domain of some composite function  $(f \circ g)$ .
  - (b) The domain of a composite function  $(f \circ g)$  is the set of all  $x$  such that  $x$  is in the domain of a function  $f$  and  $f(x)$  is in the domain of a function  $g$ .
  - (c) If there exists  $x \in \mathbb{R}$  that is not in the domain of a function  $g$ , then that  $x$  will not be in the domain of some composite function  $(f \circ g)$ .
  - (d) The domain of a composite function  $(f \circ g)$  is the set of all  $x$  such that  $x$  is in the domain of a function  $g$  and  $g(x)$  is in the domain of a function  $f$ .
4. If the domain of a composite function  $(f \circ g)$  is  $(-2, \infty)$  and  $f(x) = \frac{1}{x^2}$ , then which of the following options can be  $g(x)$ ?
  - (a)  $\frac{\sqrt{x+2}}{10}$
  - (b)  $\frac{\sqrt{x+2}}{5x}$
  - (c)  $\frac{3}{\sqrt{x+2}}$
  - (d)  $\sqrt{2-x}$

## 9 Lecture 8.9

### Inverse Functions:

1. Which of the following options is(are) CORRECT for a reversible function  $f$ ?
  - (a) For any function  $f$ ,  $f^{-1}(x) = \frac{1}{f(x)}$
  - (b) The domain of a function  $f$  is always equal to the range of  $f^{-1}$  function.
  - (c) For any  $x = a$  in the domain of a function  $f$ , if  $(a, f(a))$  is on the graph of  $f$ , then  $(f(a), a)$  is on the graph of  $f^{-1}$
  - (d) For any function  $f$ ,  $(f \circ f^{-1})(x) = x$ .
2. If  $f(x) = \sqrt{x - 5}$ , then the domain and the range of the function  $f^{-1}$  are respectively
  - (a)  $[0, \infty)$  and  $[5, \infty)$
  - (b)  $[5, \infty)$  and  $[0, \infty)$
  - (c)  $\mathbb{R}$  and  $[5, \infty)$
  - (d)  $[5, \infty)$  and  $\mathbb{R}$
3. Which of the following functions satisfy the condition  $f(x) = f^{-1}(x)$ ?
  - (a)  $f(x) = \frac{1}{x^3}$
  - (b)  $f(x) = \frac{1}{x}$
  - (c)  $f(x) = \frac{2x-1}{3x-2}$
  - (d)  $f(x) = 9 - 5x$
  - (e)  $f(x) = -x$
4. Which of the following statements is INCORRECT?
  - (a) The inverse function( $g$ ) of a function  $f(x) = \frac{1}{x^3}$  is  $g(x) = \frac{1}{\sqrt[3]{x}}$
  - (b) If  $f(x) = \frac{1}{x-11}$  and  $g(x) = 11 - \frac{1}{x}$ , then  $f(x) = g^{-1}(x)$  for all  $x \in \mathbb{R}$
  - (c)  $(f \circ f^{-1})(x) = x = (f^{-1} \circ f)(x)$ , for all  $x$  in the domain of the function  $f$ .
  - (d) A function  $f$  is symmetric to function  $f^{-1}$  about the line  $y = x$ .
5. If  $f(x) = x^3 - 5$ ,  $g(x) = \sqrt[3]{x} + 5$ ,  $h(x) = (x - 5)^3$  and  $k(x) = \sqrt[3]{x+5}$  are functions, then which of the following options is(are) true?
  - (a)  $k(x) = f^{-1}(x)$ , for all  $x \in \mathbb{R}$
  - (b)  $f(x) = h^{-1}(x)$ , for all  $x \in \mathbb{R}$
  - (c)  $g(x) = k^{-1}(x)$ , for all  $x \in \mathbb{R}$
  - (d)  $h(x) = g^{-1}(x)$ , for all  $x \in \mathbb{R}$

**BSCMA1001: Activity Questions**  
**Week-9**

## **Contents**

<b>1 Lecture-1</b>	<b>2</b>
<b>2 Lecture-2</b>	<b>3</b>
<b>3 Lecture-3</b>	<b>3</b>
<b>4 Lecture-4</b>	<b>4</b>
<b>5 Lecture-5</b>	<b>4</b>
<b>6 Lecture-6</b>	<b>5</b>
<b>7 Lecture-7</b>	<b>5</b>

# 1 Lecture-1

1. For which point on the Cartesian plane, will the equations  $x = \log_2 y = \log_{0.2} y$  be valid?  
 (1,1)  
 (0,1)  
 (2,1)  
 (0,2)
2. The domain of  $f(x) = \log_2(2 - x)$  is  
  $(-\infty, 1)$   
  $(-\infty, 2)$   
  $(-\infty, 1]$   
  $(-\infty, 2]$
3. Consider the function  $f(x) = \log_{10}((\log_{10}x)^2 - 8\log_{10}x + 15)$ . What is the domain of  $f$ ?  
  $(0, 10^{-5}) \cup (10^{-3}, \infty)$   
  $(0, 10^{-5}] \cup [10^{-3}, \infty)$   
  $(0, 10^3) \cup (10^5, \infty)$   
  $(0, 10^3] \cup [10^5, \infty)$
4. The set of all  $x$  for which there are no functions of the form  $f(x) = \log_{\frac{x-1}{x+1}}(\frac{x^2+1}{x^2-1})$  is  
  $(-\infty, 0) \cup (0, \infty)$   
  $[-1, 1]$   
  $(-1, 1)$   
  $(-\infty, -1] \cup [1, \infty)$
5. What is the domain of the function  $f(x) = \log(-(xe^{3x} - 27x))$ ?  
  $(0, \ln 27)$   
  $(0, \ln 2)$   
  $(0, \ln 3)$   
  $(0, \ln 3 - \ln 2)$

## 2 Lecture-2

6. The only difference between the graphs of  $f(x) = \log_2 x$  and  $g(x) = \log_2(x - 1)$  will be-
- The ordinate values of  $g(x)$  will be 1 more than the ordinate values of  $f(x)$ .
  - The abscissa values of  $g(x)$  will be 1 more than the abscissa values of  $f(x)$ .
  - Both abscissa and ordinate values of  $g(x)$  will be 1 more than the abscissa and ordinate values of  $f(x)$  respectively.
  - There will be no difference.
7. Which of the following statements is/are true for the function  $f(x) = \ln|x|$ ?
- $f$  is an increasing function.
  - The straight line  $x = 0$  is an asymptote of  $f$ .
  - The inverse of  $f$  is  $e^{|x|}$ .
  - The domain of  $f$  is  $(-\infty, 0) \cup (0, \infty)$ .
8. Consider the function  $f(x) = \log_2(\log_2(\log_2(x)))$ . Which of the following is(are) true about  $f$ ?
- $f$  is one-one.
  - The domain of  $f$  is  $(0, \infty)$ .
  - $f$  has an inverse.
  - The straight line  $x = 8$  is an asymptote of  $f$ .

## 3 Lecture-3

9. If the domain of  $f(x)$  is  $(-3, 1)$ , then the domain of  $f(\ln x)$  is
- $(e^{-1}, e^3)$
  - $(0, \infty)$
  - $(1, \infty)$
  - $(e^{-3}, e^1)$
10. Consider the function  $f(x) = \ln(e^x - e^{-x})$ . Find the correct options.
- $f$  is an one-one function.
  - The domain of  $f$  is  $\mathbb{R}$ .
  - $f$  is an increasing function.
  - none of the above.
11. Solve for  $x$  in  $3^{(x+2)} = 243$ .

- 4
- 3
- 2
- 1

12. Solve for  $x$  in  $e^{(4^x - 2^x - 12)} = 1$ .

- 1
- 2
- 1
- 2

## 4 Lecture-4

13. For  $0 < a < 1$  and  $M > 0$ ,  $\log_a(M^2) = ?$

- 1
- $2 \log_a M$
- $2 \log_M a$
- $\log_a 3M$

14. Solve for  $x$ :  $\log_{12}(x - 2) + \log_{12}(x + 2) = 1$

- $x = -4$
- $x = 4$
- $x = 2$
- $x = -2$

15. The number of solutions of  $\ln(\frac{x^2}{4}) - \ln(x - 1) = \log_5 5$  is

- 0
- 1
- 2
- 3

## 5 Lecture-5

16. How many digits are there in  $15^{7^2}$ ?

- 49

- 50
  - 57
  - 58
17. Suppose a certain amount of money  $M$  is invested in a mutual fund at an annual rate of interest of 5%. How long(approximately) does it take to triple the initial investment, assuming interest is compounded thrice a year?
- 11 years
  - 14 years
  - 19 years
  - 22 years

## 6 Lecture-6

18. If  $\ln(x^5) = (\ln x)^2$ , then the value of  $\ln x$  is

- 2
- 5
- 5
- 2

19. The number of solution of  $\log_8(x^3 - 1) = \log_2(x - 1)$  is

- 0
- 1
- 3
- $\infty$

## 7 Lecture-7

20. If the value of  $(\frac{1}{\log_3 \pi} + \frac{1}{\log_4 \pi})$  is  $m$ , then which of the following options are true for  $m$ .

- $m \geq 3.178$
- $2 < m < 2.2$
- $m \leq 2$
- $m < \log_2 2$

21. Consider the function  $f(x) = \log_{10}(x - [x])$  (where  $[x]$  is the greatest integer less or equal to  $x$ ), and  $D \subset \mathbb{R}$  is the set of points at which  $f$  is defined. Which of the following options are correct?

- ✓ The set  $D$  is infinite.
  - ✓ The cardinality of the set  $\mathbb{R} \setminus D$  is infinite.
  - ✓ The graph of  $f(x)$  have an infinite number of vertical asymptotes.
  - $f$  is an invertible function on  $D$ .
  - Range of the function  $f$  is  $\mathbb{R}$ .
22. Suppose  $x$  and  $y$  are positive real number. If  $\log_x(2) + \log_y(8) = 0$ , then which of the following options are true for  $x$  and  $y$ .

- ✓  $x = 2, y = \frac{1}{8}$
- $xy^3 = 1$
- $x = 27, y = \frac{1}{3}$
- ✓  $x^3y = 1$

**BSCMA1001: Activity Questions**  
**Week-10**  
**Graphs**

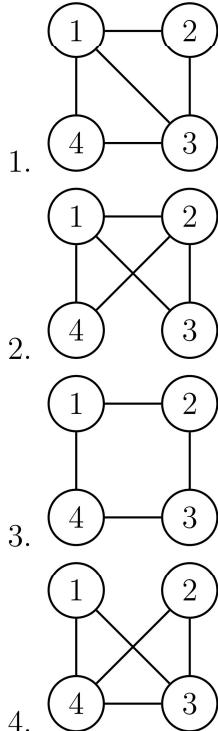
## Contents

<b>1 Lecture-59</b>	<b>2</b>
I    Multiple Choice Questions (MCQ): . . . . .	2
II    Multiple Select Questions (MSQ): . . . . .	4
<b>2 Lecture-60</b>	<b>5</b>
I    Multiple Choice Questions (MCQ): . . . . .	5
II    Multiple Select Questions (MSQ): . . . . .	8
<b>3 Lecture-61</b>	<b>8</b>
I    Multiple Choice Questions (MCQ): . . . . .	8
II    Multiple Select Questions (MSQ): . . . . .	9
<b>4 Lecture 62</b>	<b>10</b>
I    Multiple Choice Questions (MCQ): . . . . .	10
<b>5 Lecture 63</b>	<b>11</b>
I    Multiple Choice Questions (MCQ): . . . . .	11
<b>6 Lecture 64</b>	<b>14</b>
I    Multiple Choice Question (MCQ): . . . . .	14
II    Multiple Choice Question (MCQ): . . . . .	15
<b>7 Lecture 65</b>	<b>15</b>
I    Multiple Choice Question (MCQ): . . . . .	15

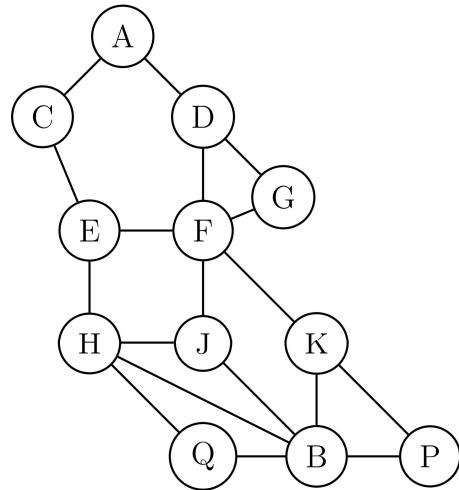
# 1 Lecture-59

## I Multiple Choice Questions (MCQ):

1. Which of the following options represents the graph  $G=(V,E)$  where  $V=\{1,2,3,4\}$ ,  
 $E=\{(1,2),(1,3),(1,4),(2,3),(3,4)\}$ . [Ans: Option 1]



2. The person 'A' is a job applicant while another person 'B' is a hiring manager at a company. Although both of them are members of the website 'Linked-In', 'A' is not directly connected to 'B' via the website. The networks of 'A' and 'B' are shown in the graph below. Choose the option which shows one of the shortest paths of connecting 'A' and 'B'.



1. ACEHJB
  2. **ADFKB**
  3. ADGB
  4. AKB
3. An electrical wire having a resistor can be represented as an edge of a graph i.e., a resistor is equivalent to two nodes connected with one edge, (shown in figure [AQ-10.1](#)) and if there is no resistor, it will be counted as only one node.

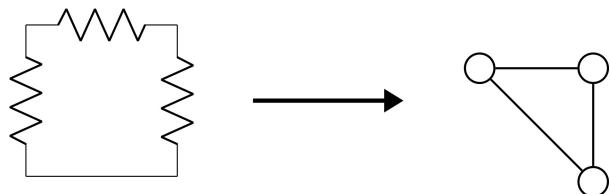


Figure AQ-10.1

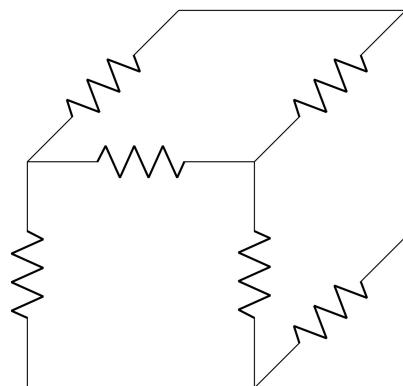
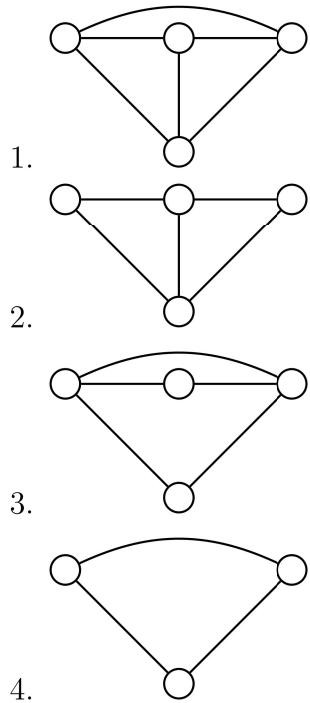


Figure AQ-10.2

Based on the figure [AQ-10.1](#), find which graph represents the network shown in figure [AQ-10.2](#).  
[Ans: option 1]



## II Multiple Select Questions (MSQ):

4. A graph  $G = (V, E)$  is shown in figure [AQ-10.3](#), where  $V$  is the set of nodes in the graph and  $E$  is the set of edges.

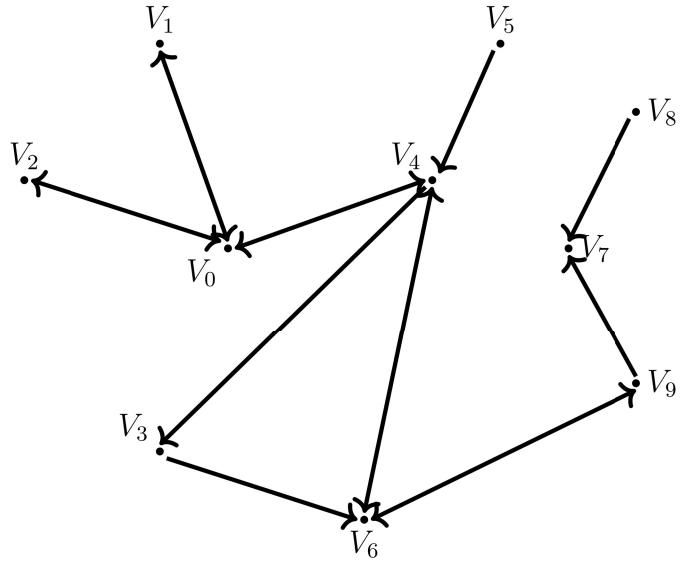


Figure AQ-10.3

Choose the set of correct options.

1.  $G$  is an undirected graph.
2.  $G$  is a directed graph.
3.  $V_4$  is reachable from  $V_1, V_2$ , and  $V_5$ .
4.  $V_4$  is reachable from every node.
5.  $V_7$  is reachable from every node..
6. Only  $V_7$  is not reachable to  $V_4$ .

## 2 Lecture-60

### I Multiple Choice Questions (MCQ):

1. In a factory, there are 10 buildings representing different departments. The factory wants some of the buildings as emergency assembly points such that any employee can reach an assembly point without having to go past another building. For that purpose, the factory decided to use the graph as shown in figure AQ-10.4. The nodes represents the buildings and the edges represents the path between two buildings. If  $V_a$  is a set of nodes such that  $V_a$  represents the minimum required nodes for the assembly points so that it can cover all the employees coming out from the buildings, then choose the correct option.

1.  $V_a = \{B_1, B_5, B_7\}$
2.  $V_a = \{B_1, B_5, B_8\}$

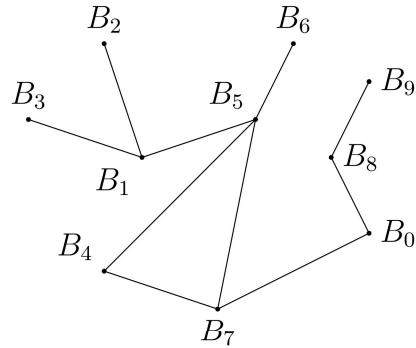


Figure AQ-10.4

3.  $V_a = \{B_1, B_7, B_9\}$
4.  $V_a = \{B_3, B_2, B_5\}$

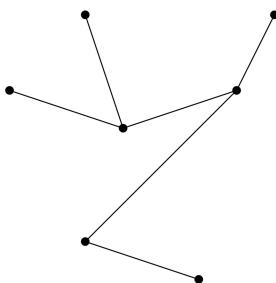
**Use the following information for questions 2 and 3.**

A college conducts an online gaming tournament for one day. There are seven games in that tournament and the time slots for those games are mentioned in the table [AQ-10.4](#).

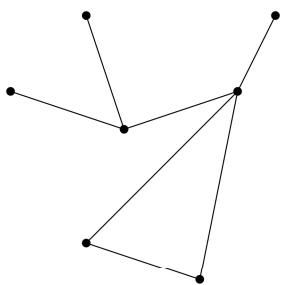
Game	Time slots
Fortnite	10:00 - 11:00
DoTA	10:30 - 11:30
Rocket League	10:40 - 11:40
Destiny	11:35 - 12:15
Battlefield	11:50 - 12:35
Titanfall	12:30 - 13:00
Hearthstone	12:20 - 13:00

Table AQ-10.4

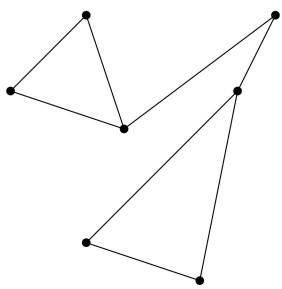
2. Let games be represented as nodes, with an edge between two nodes if the timings of the corresponding games clash. Which of the graphs below best represents the data in the table [AQ-10.4](#)? [Ans: option 3]



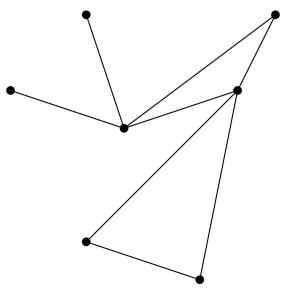
1.



2.



3.



4.

3. Find the minimum possible number of computers for the tournament.

1. 7
2. 5
3. 4
4. 3

## **II   Multiple Select Questions (MSQ):**

4. A college has sent a sports team for sport festival in other college. The team is multi-talented and each individual has the skills to take part in one or more than one sports. However, the same individual cannot be part of the team for two different sports because of a possible clash in timings. A graph (shown in figure AQ-10.5) is created where the nodes are the events and edges connect pairs of sports where the teams share a member. If the college wants the team members to take part in maximum number of sports, then choose the set of correct options.

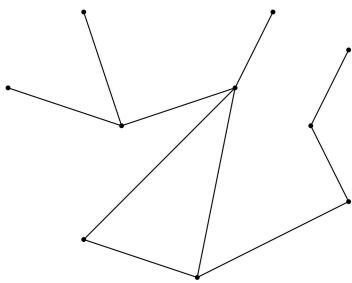


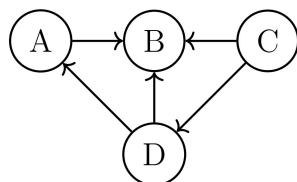
Figure AQ-10.5

1. The question can be solved by finding the maximum size independent set.
2. The question can be solved by finding the minimum size vertex cover.
3. The question can be solved by finding the minimal coloring.
4. Maximum number of sports in which the team can participate is 5.
5. Maximum number of sports in which the team can participate is 6.
6. Maximum number of sports in which the team can participate is 7.

## **3   Lecture-61**

### **I   Multiple Choice Questions (MCQ):**

1. Find the adjacency matrix for the following graph. (Take the sequence as A, B, C, and D). [Ans: option 2]



1.

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

2.

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 \end{bmatrix}$$

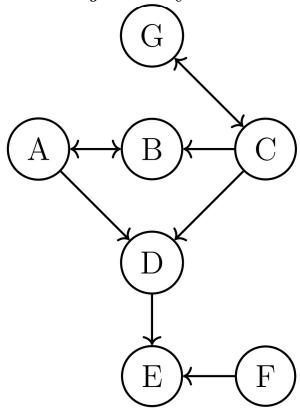
3.

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

4.

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

2. An adjacency list is created for the graph shown below. Find the value of c, d, and e.



A	{B, D}
B	{A}
C	c
D	d
E	e

1.  $c = \{B, G, D\}$ ,  $d = \{A, C, E\}$
2.  $c = \{B, G, D\}$ ,  $e = \{E\}$
3.  $c = \{B, D\}$ ,  $d = \{A, C\}$
4.  $c = \{B, G, D\}$ ,  $e = \emptyset$

## II   Multiple Select Questions (MSQ):

3. Choose the set of correct options based on the adjacency matrix given below.

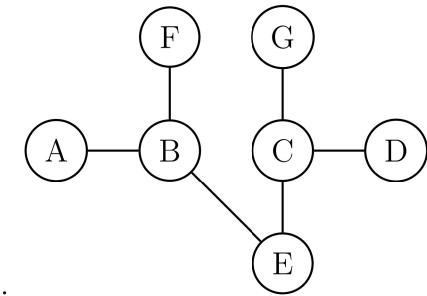
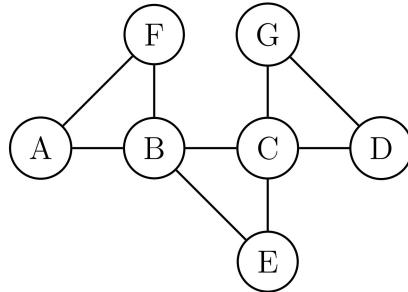
$$\begin{bmatrix} 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 \end{bmatrix}$$

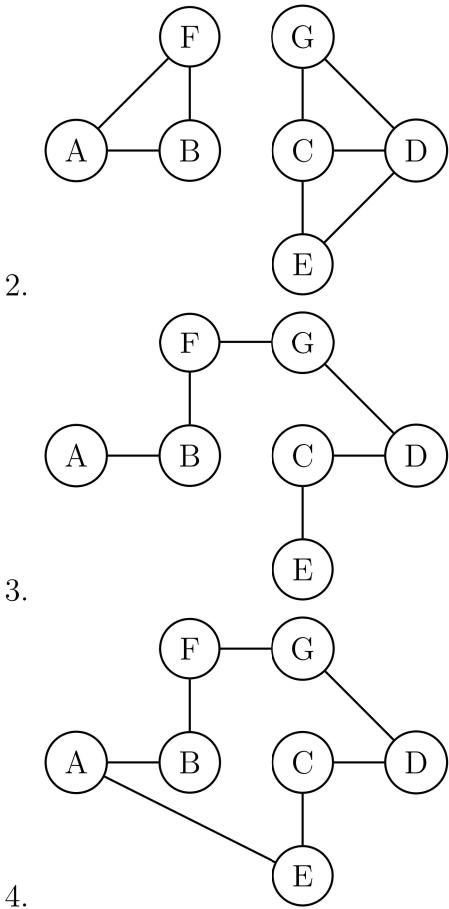
1. The graph has 5 nodes.
2. There are 10 edges in the graph.
3. There are 5 edges in the graph.
4. The sum of the degrees of all the nodes is 20.
5. The sum of the degrees of all the nodes is 10.

## 4 Lecture 62

### I Multiple Choice Questions (MCQ):

1. Suppose we perform BFS so that when we visit a vertex, we explore its unvisited neighbors in a random order. Which of the following graphs could represent the edges explored by BFS starting at vertex 'E'? [Ans: Option 1]





2. The BFS algorithm uses a queue. A queue is a
1. LIFO (Last-In-First-Out) structure
  2. FILO (First-In-Last-Out) structure
  3. **FIFO (First-In-First-Out) structure**
  4. The word 'queue' does not represent any particular structure.

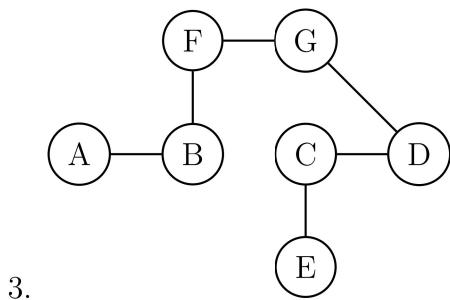
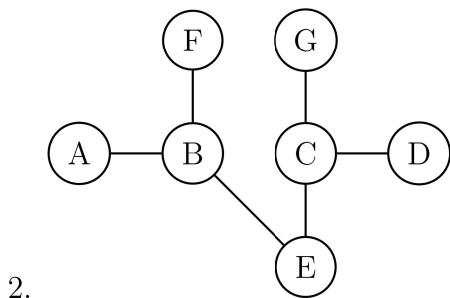
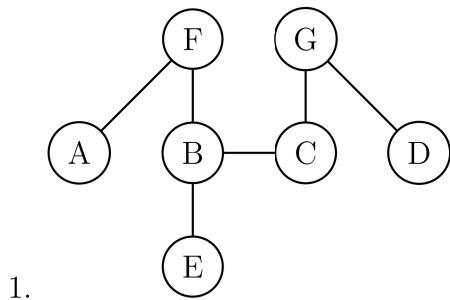
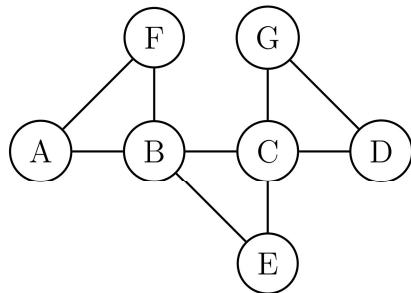
[Ans: Option 3]

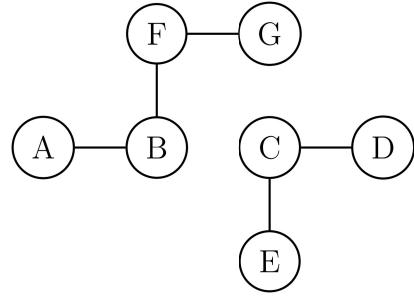
## 5 Lecture 63

### I Multiple Choice Questions (MCQ):

1. The DFS algorithm uses a stack. A stack is a
1. FIFO (First-In-First-Out) structure
  2. **LIFO (Last-In-First-Out) structure**
  3. FILO (First-In-Last-Out) structure
  4. The word 'stack' does not represent any particular structure.

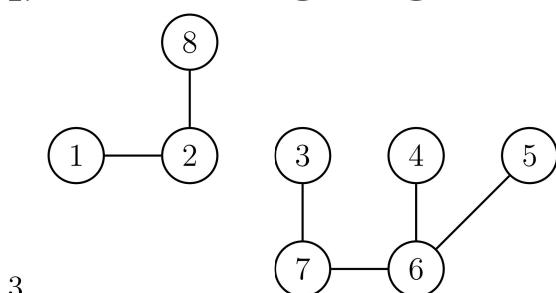
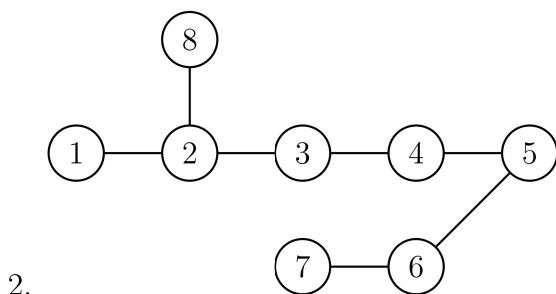
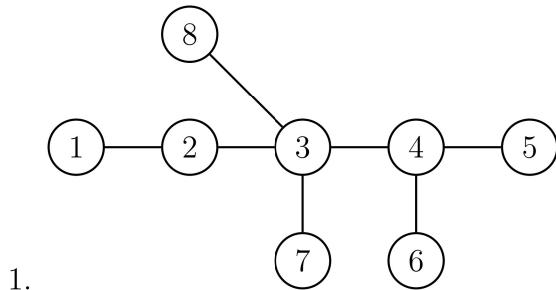
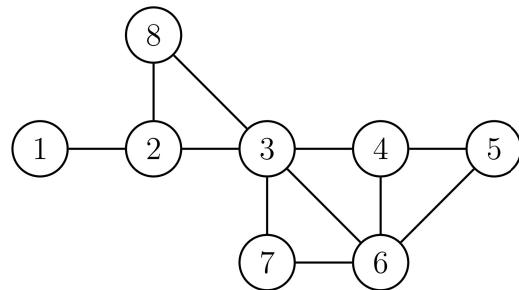
2. Suppose we perform DFS so that when we visit a vertex, we explore its unvisited neighbors in a random order. Which of the following graphs could represent the edges explored by DFS starting at vertex 'E'? [Ans: Option 1]

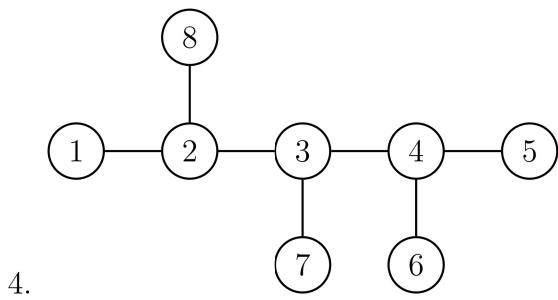




3. Suppose we perform DFS so that when we visit a vertex, we explore its unvisited neighbors in a random order. Which of the following graphs could represent the edges explored by DFS starting at vertex 3?

[Ans: Option 2]

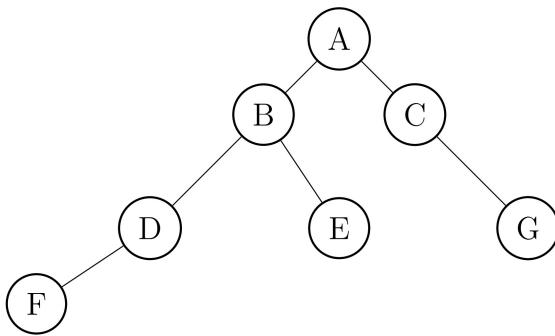




## 6 Lecture 64

### I Multiple Choice Question (MCQ:)

1. If we perform BFS in a directed graph G, how many times do we check whether a vertex v is visited?
  1. 1
  2.  $\text{indegree}(v)$
  3.  $\text{outdegree}(v)$
  4. 2
2. We obtain the following DFS tree rooted at node A for an undirected graph with vertices  $\{A, B, C, D, E, F, G, H, I, J\}$

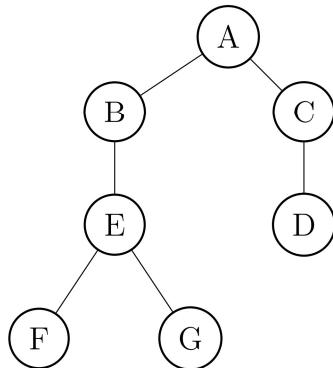


Which of the following cannot be an edge in the original graph?

1.  $(B, F)$
2.  $(A, G)$
3.  $(E, F)$
4.  $(A, F)$

## II Multiple Choice Question (MCQ:)

3. Suppose we obtain the following BFS tree rooted at node  $A$  for an undirected graph with vertices  $\{A, B, C, D, E, F, G\}$ . Which of the following cannot be an edge in the original graph?

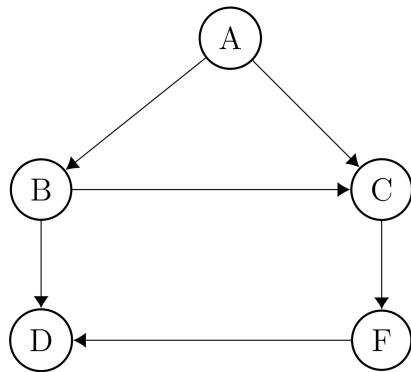


1.  $(A, E)$
2.  $(A, D)$
3.  $(A, F)$
4.  $(B, C)$

## 7 Lecture 65

### I Multiple Choice Question (MCQ:)

1. Consider the following directed graph.



Suppose DFS of this graph is performed from node A, such that when we visit a vertex, we explore its unvisited neighbours in alphabetical order.

Which of the following options are correct?

[Ans: C]

1.  $CF$  is a forward edge.

2.  $FD$  is a backward edge.
3.  $AC$  is a forward edge.
4.  $BD$  is a backward edge.