Exercise-1

✍ **Marked questions are recommended for Revision.**

SUBJECTIVE QUESTIONS

Section (A) : Representation of sets, Types of sets, subset and power set

A-1.✍ Which of the following collections is not a set ?
(i) The collection of natural numbers between 2 and 20
(ii) The collectihon of numbers which satisfy the equation $x^2 - 5x + 6 = 0$
(iii) The collection of prime numbers between 1 and 100.
(iv) The collection of all intelligent women in Jalandhar.

A-2. Write the set A = {x : x is a positive prime < 10} in the tabular form

A-3. Which of the following is the empty / non-empty set
(i) {x : x is a real number and $x^2 - 1 = 0$} (ii) {x : x is a real number and $x^2 + 1 = 0$}
(iii) {x : x is a real number and $x^2 - 9 = 0$} (iv) {x : x is a real number and $x^2 = x + 2$}

A-4. Which of the folowing sets is an finite / infinite set ?
(i) Set of divisors of 24
(ii) Set of all real number which lie between 1 and 2
(iii) Set of all humman beings living in India.
(iv) Set of all three digit natural numbers

A-5. If A = $\{x : -3 < x < 3, x \in Z\}$ then find the number of subsets of A.

A-6.✍ Find Power set of the set A = $\{\phi, \{\phi\}\}$.

Section (B) : Operations on sets, Law of Algebra of sets

B-1. Sets A and B have 3 and 6 elements respectively. What can be the minimum number of elements in $A \cup B$?

B-2. Given the sets A = {1, 2, 3}, B = {3, 4}, C = {4, 5, 6}, then find $A \cup (B \cap C)$.

B-3. Let $A = \{x : x \in R, -1 < x < 1\}$, $B = \{x : x \in R, x \le 0 \text{ or } x \ge 2\}$ and $A \cup B = R - D$, then find set D

B-4. Find the smallest set A such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$

B-5. If A = {2, 3, 4, 8, 10}, B = {3, 4, 5, 10, 12}, C = {4, 5, 6, 12, 14} then find $(A \cap B) \cup (A \cap C)$.

B-6. Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, A = {1, 2, 5}, B = {6, 7}, then show that $A \cap B'$ is same as set A.

B-7. If $A = \{x : x = 4n + 1, n \le 5, n \in N\}$ and B $\{3n : n \le 8, n \in N\}$, then find $(A - (A - B))$.

B-8.✍ If $aN = \{ax : x \in N\}$ and $bN \cap cN = dN$, where $b, c \in N$, $b \ge 2$, $c \ge 2$ are relatively prime, then find relation between d,b and c.

Section (C) : Cardinal number Problems

C-1. Let n(U) = 700, n(A) = 200, n(B) = 300 and $n(A \cap B) = 100$, then find $n(A' \cap B')$

C-2. In a group of 1000 people, there are 750 people, who can speak Hindi and 400 people, who can speak Bengali.

(i) Find number of people who can speak Hindi only.
(ii) Number of people who can speak Bengali only is
(iii) Number of people who can speak both Hindi and Bengali is

C-3. A class has 175 students. The following data shows the number of students obtaining one or more subjects : Mathematics 100, Physics 70, Chemistry 40, Mathematics and Physics 30, Mathematics and Chemistry 28, Physics and Chemistry 23, Mathematics & Physics & Chemistry 18. How many students have offered Mathematics alone ?

C-4. 31 candidates appeared for an examination, 15 candidates passed in English, 15 candidates passed in Hindi, 20 candidates passed in Sanskrit. 3 candidates passed only in English. 4. candidates passed only in Hindi, 7 candidates passed only in Sanskrit. 2 candidates passed in all the three subjects How many candidates passed only in two subjects ?

C-5. In a survery, it was found that 21 persons liked product A, 26 liked product B and 29 liked product C. If 14 persons liked products A and B, 12 liked products C and A, 13 persons liked products B and C and 8 liked all the three products then
(i) Find the number of persons who liked the product C only
(ii) The number of persons who like the products A and B but not C

Section (D) : Graphs of polynomial

D-1. Draw the graph of following function
(i) $y = 4x^3 - 30x^2 + 72x - 55$
(ii) $y = x^3 + x^2 + x - 3$
(iii) $y = x^4 - 8x^3 + 22x^2 - 24x + 8.5$
(iv) $y = x^4 - 6x^2 - 8x + 13$
(v) $y = x^4 - 4x^3 + 8x^2 - 8x - 21$
(vi) $y = x^4 + 2x^2 + 4x + 1$

D-2. Find the number of solution of the following equation $x^4 - 6x^2 - 8x - 3 = 0$

D-3. Find the range of 'λ' for which equation $x^3 + x^2 - x - 1 - \lambda = 0$ has 3 real solution.

Section (E) : Rational inequaties, Modulus & Graphical transformations

E-1. Solve the following rational in equalities
(i) $\dfrac{(x-1)(x+2)}{(x-3)(x+3)} < 0$
(ii) $\dfrac{(1-x)^3(x+2)^4}{(x+9)^2(x-8)} \ge 0$
(iii) $\dfrac{(x^2-3x+1)^3}{(x-1)(x+2)} \le 0$
(iv) $\dfrac{x(2^x-3^x)}{(x^2+x+1)(x-1)} > 0$
(v) $\dfrac{(x-1)(x-2)(x-3)}{(x+1)(x+2)(x+3)} \le 1$
(vi) $1 < \dfrac{3x^2-7x+8}{x^2+1} \le 2$

E-2. Find the number of positive integral value of x satisfying the inequality $\dfrac{(3^x-5^x)(x-2)}{(x^2+5x+2)} \ge 0$

E-3. If $1 < \dfrac{x-1}{x+2} < 7$ then find the range of
(i) x
(ii) x^2
(iii) $\dfrac{1}{x}$

E-4. Define and plot
(i) $y = |x-2| + 3\,|x-3|$
(ii) $y = ||x-2|-3| + |x|$
(iii) $y = |x-1| + |x-4| - 2\,|x+1|$

E-5. Solve for x
(i) $|x + 1| = 4x + 3$
(ii) $|x + 1| = |x + 3|$
(iii) $7|x - 2| - |x - 7| = 5$

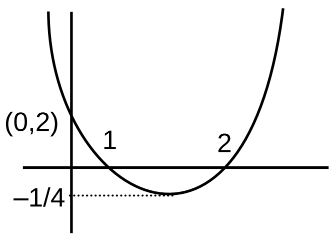
(iv) $||x - 1| - 2| = 6x + 8$
(v) $|2x^2 - 3x + 1| = |x^2 + x - 3|$

E-6. Solve for x
(i) $2^{|x+1|} + 2^{|x|} = 6$ and $x \in I$
(ii) $x^2 + x + 1 + |x - 3| \le |x^2 + 2x - 2|$
(iii) $|2x - 4| - 2|x^2 + x - 3| + 2|x - 1||x + 1| = 0$

E-7. Solve the following in equalities
(i) $|x + 7| > 5$
(ii) $|x + 3| < 10$
(iii) $(x + 2) < |x^2 + 3x + 5|$
(iv) $\left|\frac{2x-1}{x-1}\right| > 2$
(v) $|x - 6| \le x^2 - 5x + 9$
(vi) $\frac{x^2 - |x| - 12}{x - 3} \ge 2x$
(vii) $(|x - 1| - 3)(|x + 2| - 5) < 0$
(viii) $|x - 1| + |x - 2| + |x - 3| \le 6$

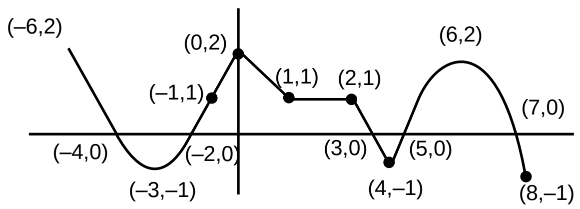
E-8. Find the number of solution of the following equation
(i) $|||x - 1| - 2| - 1| = 1$
(ii) $2|(x - 1)(x - 5)| = (x - 3)^2$

E-9. If graph of $y = (x - 1)(x - 2)$ is



then draw the graph of the following
(i) $y = |(x - 1)(x - 2)|$
(ii) $|y| = (x - 1)(x - 2)$
(iii) $y = (|x| - 1)(|x| - 2)$
(iv) $y = |(|x| - 1)(|x| - 2)|$
(v) $|y| = |(|x| - 1)(|x| - 2)|$

E-10. Let graph of $y = f(x)$ is



Now draw the graph of following
(i) $y = 2f(-x)$
(ii) $y = f(|x + 1|)$
(iii) $y = -f(|x| + 1)$
(iv) $|y + 1| = f(2x - 1)\ \forall\ x \in [-1,3]$

Section (F) : Irrational inequality, logarithmic equation & logarithimic inequality

F-1. Solve the following inequlities

(i) $\sqrt{x-1} < x - 3$

(ii) $\sqrt{x-3} > \sqrt{7-x}$

(iii) $\sqrt{x^2+4x+9} > x + 2$

(iv) $4 - x < \sqrt{2x-x^2}$

(v) $\sqrt[3]{(x-4)(x-6)} > 2$

(vi) $\sqrt{x^2+3x+5} < \sqrt{x^2+x+1}$

(vii) $\sqrt{\frac{1}{x^2}-\frac{3}{x}} < \frac{1}{x}-\frac{1}{2}$

(viii) $\frac{\sqrt{2x^2+7x-4}}{x+4} \le \frac{1}{2}$

(ix) $\frac{|x+2|-|x|}{\sqrt{8-x^3}} \ge 0$

F-2. Find the value of

(i) $(\log_{10}5)(\log_{10}20) + (\log_{10}2)^2$

(ii) $\sqrt[3]{5^{\frac{1}{\log_7 5}} + \frac{1}{(-\log_{10} 0.1)}}$

(iii) $\log_{0.75} \log_2 \sqrt{\sqrt{\frac{1}{0.125}}}$

(iv) $5^{\log_{\sqrt{5}} 2} + 9^{\log_3 7} - 8^{\log_2 5}$

(v) $\left(\frac{1}{49}\right)^{1+\log_7 2} + 5^{-\log_{1/5} 7}$

(vi) $7^{\log_3 5} + 3^{\log_5 7} - 5^{\log_3 7} - 7^{\log_5 3}$

F-3. Let $\log_{10}2 = a$ and $\log_{10}3 = b$ determine the following in term of a and b

(i) $\log_4 100 + 2\log_{27} 100$

(ii) $\log_{144} \sqrt{45}$

F-4. Prove that

(i) $\frac{1}{\log_{\sqrt{bc}}(abc)} + \frac{1}{\log_{\sqrt{ca}} abc} + \frac{1}{\log_{\sqrt{ab}}(abc)} = 1$

(ii) $(\log_2 10)\,(\log_2 80) - (\log_2 5)\,(\log_2 160) = 4$

(iii) $a^{\sqrt{\log_a b}} = b^{\sqrt{\log_b a}}$

(iv) $\frac{a^{\log_{2^{1/4}} 2} - 3^{\log_{27}(a^2+1)^3} - 2a}{\left(7^{4\log_{49} a}\right) - a - 1} = a^2 + a + 1$

F-5 Solve the following equations :

(i) $\log_x(4x - 3) = 2$

(ii) $\log_2(x - 1) + \log_2(x - 3) = 3$

(iii) $\log_2 (\log_8 (x^2 - 1)) = 0$

(iv) $4^{\log_2 x} - 2x - 3 = 0$

F-6. Solve the following equations

(i) $\frac{\log_2(9-2^x)}{3-x} = 1$

(ii) $x^{\frac{\log_{10} x+7}{4}} = 10^{(\log_{10} x+1)}$

(iii) $(\log_{10}(100x))^2 + (\log_{10}(10x))^2 = 14 + \log_{10}(1/x)$

(iv) $\log_{10}5 + \log_{10}(x + 10) - 1 = \log_{10}(21x - 20) - \log_{10}(2x - 1)$

(v) $5^{2x} = 3^{2x} + 2.5^x + 2.3^x$

F-7 Solve the following inequalities

(i) $\log_5 (3x - 1) < 1$

(ii) $(\log_{.5}x)^2 + \log_{.5}x - 2 \le 0$

(iii) $\log_3(x + 1) + \log_3(x + 7) \ge 3$

(iv) $\log_{1/2} \log_3(x^2 + 5) + 1 \le 0$

F-8. Solve the following inequalities

(i) $|\log_3 x| - \log_3 x - 3 < 0$

(ii) $\frac{x-1}{\log_3(9-3^x)-3} \le 1$

(iii) $\log_{\frac{x-1}{x-5}} (x-2) > 0$

(iv) $\log_x (x^3 - x^2 - 2x) < 3$

F-9 Solve the following inequalities

(i) $15^x - 25.3^x - 9.5^x + 225 \ge 0$

(ii) $8.\left(\frac{3^{x-2}}{3^x - 2^x}\right) > 1 + \left(\frac{2}{3}\right)^x$

Section (G) : Greatest integer function, fractional part & signum function

G-1. Solve for x (where [•] denotes greatest integer function and {•} represent fractional part function)
(i) $[2x] = 1$ (ii) $\{x\}^2 + [x] = 2$ (iii) $6\{x\}^2 - 5\{x\} + 1 = 0$ (iv) $6[x]^2 - 5[x] - 1 = 0$

G-2 Solve the following equations
(where [•] denotes greatest integer function and {•} represent fractional part function)
(i) $2[x] + 3\{x\} = 4x - 1$ (ii) $4[x] = x + \{x\}$ (iii) $[x] + 2\{-x\} = 3x$

G-3. Solve the following equations (where [•] denotes greatest integer function and {•} represent fractional part function and sgn represents signum function)
(i) $[x] + |x - 2| \le 0$ and $x \in [-1,3]$ (ii) $[2x] - 2x = [x + 1]$
(iii) $[x^2] + 2\,[x] = 3x,\ 0 \le x \le 2$

G-4. Solve the following inequalities (where [•] denotes greatest integer function and {•} represent fractional part function)
(i) $[x + [x]] < 0$ (ii) $[2x^2 - x] < 1$ (iii) $\{x\} < \frac{1}{2}$

G-5 Solve the following equations
(i) $\text{sgn}\,(\{[x]\}) = 0$ (ii) $\text{sgn}(x^2 - 2x - 8) = -1$ (iii) $\text{sgn}\left(\frac{x^2 - 5x + 4}{\{x\}}\right) = -1$

G-6 Find the number of solution of equation (where sgn represent signum function)
(i) $\text{sgn}\,(x) = |x|$ (ii) $\text{sgn}\,(x^2 - 1) = (x + 1)^2$

Section (H) : Trigonometric Equations

H-1. Solve the following equation
(i) $5\cos 2\theta + 2\cos^2\frac{\theta}{2} + 1 = 0,\ -\frac{\pi}{2} < \theta < \frac{\pi}{2}$
(ii) $\sin 7\theta + \sin 4\theta + \sin\theta = 0,\ 0 \le \theta \le \pi$
(iii) $\tan\theta + \sec\theta = \sqrt{3},\ \ 0 \le \theta \le 2\pi$

H-2. Find the most general solution of the following
(i) $\sin 6x = \sin 4x - \sin 2x$
(ii) $\sec 4x - \sec 2x = 2$
(iii) $\tan\left(\frac{\pi}{4} + x\right) + \tan\left(\frac{\pi}{4} - x\right) = 2$

H-3. Solve the following inequations
(i) $(\sin x - 2)(2\sin x - 1) < 0$ (ii) $(2\cos x - 1)(\cos x) \le 0$
(iii) $\sin x + \sqrt{3}\cos x \ge 1$ (iv) $\cos^2 x + \sin x \le 2$
(v) $\tan^2 x > 3$

H-4 Find the number of solution of the following equation
(i) $|\sin x| = \left|\frac{x}{10}\right|$ (ii) $\ell n|x| = \sin\pi x$

H-5. Solve the inequation $2^{\frac{1}{\cos^2 x}}\sqrt{y^2 - y + \frac{1}{2}} \le 1$

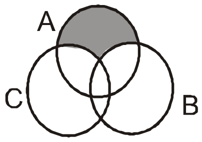
Exercise-2

Marked questions are recommended for Revision.
*** Marked Questions may have more than one correct option.**

OBJECTIVE QUESTIONS

1. Which of the following are true ?
(A) $[3, 7] \subseteq (2, 10)$ (B) $(0, \infty) \subseteq (4, \infty)$ (C) $(5, 7] \subseteq [5, 7)$ (D) $[2, 7] \subseteq (2.9, 8)$

2.✍ The shaded region in the given figure is

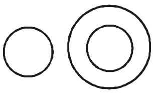
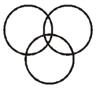
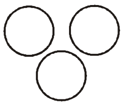
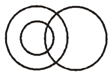


(A) $A \cap (B \cup C)$ (B) $A \cup (B \cap C)$ (C) $A \cap (B - C)$ (D) $A - (B \cup C)$

3. Consider the following statements :
1. $N \cup (B \cap Z) = (N \cup B) \cap Z$ for any subset B of R, where N is the set of positive integers, Z is the set of integers, R is the set of real numbers.
2. Let $A = \{n \in N : 1 \le n \le 24$, n is a multiple of 3$\}$. There exists no subset B of N such that the number of elemets in A is equal to the number of elements in B.

Which of the above statements is/are correct ?
(A) 1 only (B) 2 only (C) Both 1 and 2 (D) Neither 1 nor 2

4.✍ Which of the following venn-diagrams best represents the sets of females, mothers and doctors ?

(A)  (B)  (C)  (D) 

5.✍ In a college of 300 students, every student reads 5 newspapers and every newspaper is read by 60 students. The number of newspaper is-
(A) at least 30 (B) at most 20 (C) exactly 25 (D) exactly 30

6.✍ In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3 % buy B and C and 4% buy A and C. If 2% families buy all the three news papers, then number of families which buy newspaper A only is
(A) 3100 (B) 3300 (C) 2900 (D) 1400

7. Let A_1, A_2 and A_3 be subsets of a set X. Which one of the following is correct ?
(A) $A_1 \cup A_2 \cup A_3$ is the smallest subset of X containing elements of each of A_1, A_2 and A_3
(B) $A_1 \cup A_2 \cup A_3$ is the smallest subset of X containing either A_1 or $A_2 \cup A_3$ but not both
(C) The smallest subset of X containing $A_1 \cup A_2$ and A_3 equals the smallest subset of X containing both A_1 and $A_2 \cup A_3$ only if $A_2 = A_3$
(D) None of these

8. Let A, B, C be distinct subsets of a universal set U. For a subset X of U, let X ' denote the complement of X in U.
Consider the following sets :
1. $((A \cap B) \cup C)' \cap B')' = B \cap C$
2. $(A' \cap B') \cap (A \cup B \cup C') = (A \cup (B \cup C))'$

Which of the above statements is/are correct ?
(A) 1 only (B) 2 only (C) Both 1 and 2 (D) Neither 1 nor 2

9. Let U be set with number of elements in U is 2009.
Consider the following statements :
I : If A, B are subsets of U with n $(A \cup B) = 280$, then $n(A' \cap B') = x_1^3 + x_2^3 = y_1^3 + y_2^3$ for some positive integers $x_1, x_2 y_1, y_2$
II : If A is a subset of U with n (A) = 1681 and out of these 1681 elements, exactly 1075 elements belong to a subset B of U , then n (A – B) = $m^2 + p_1 p_2 p_3$ for some positive integer m and distinct primes p_1, p_2, p_3
Which of the statements given above is / are correct ?
(A) I only (B) II only (C) Both I and II (D) Neither I nor II.

10. Consider the following statements :
1. If A = {(x, y) ∈ [R × R : $x^3 + y^3 = 1$] and B = {(x, y) ∈ [R : x – y = 1]}, then A ∩ B contains exactly one elements.
2. If A = {(x, y) ∈ [R × R : $x^3 + y^3 = 1$] and B = {(x, y) ∈ [R : x + y = 1]}, then A ∩ B contains exactly two elements.
Which of the above statements is/are correct ?
(A) 1 only (B) 2 only (C) Both 1 and 2 (D) Neither 1 and 2

11. In a class of 42 students, the number of students studying different subjects are 23 in Mathematics, 24 in Physics, 19 in Chemistry, 12 in Mathematics and Physics 9 in Mathematics and Chemistry, 7 in Physics and Chemistry and 4 in all the three subjects. The number of students who have taken exactly one subject is
(A) 15 (B) 30 (C) 22 (D) 27

12. In an examination of a certain class, at least 70% of the students failed in Physics, at least 72% failed in Chemistry, at least 80% failed in Mathematics and at least 85% failed in English. How many at least must have failed in all the four subjects ?
(A) 5% (B) 7%
(C) 15% (D) Cannot be determined due to insufficient data

13.* A and B are two sets such that n(A) = 3 and n(B) = 6, then
(A) minimum value of n(A ∪ B) = 6 (B) minimum value of n(A ∪ B) = 9
(C) maximum value of n(A ∪ B) = 6 (D) maximum value of n(A ∪ B) = 9

14. The number of solution of equation $x^3 - 21x - 20 = e^x$ is/are
(A) 0 (B) 1 (C) 2 (D) 3

15. If a ≠ 0 then complete set of solution of $\frac{x^2 - 2x + 2^{|a|}}{x^2 - a^2} > 0$ is
(A) $(-\infty, -|a|) \cup (|a|, \infty)$ (B) $(-\infty, -a) \cup (a, \infty)$
(C) $(-\infty, -a) \cup [a, \infty)$ (D) $(-|a|, |a|)$

16. The complete set of solution of equation $\left|1 - \frac{|x|}{1+|x|}\right| = \frac{1}{2}$ is {a,b} then
(A) a + b = 8 (B) a + b = 3 (C) a + b = 0 (D) a + b = – 3

17. The smallest integral value of a such that |x + a – 3| + |x –2a| = |2x – a –3| is true ∀ x ∈ R is
(A) 0 (B) 1 (C) 2 (D) 3

18. Number of positive integral solution of the equation $|x^2 - 3x - 3| > |x^2 + 7x - 13|$ is/are
(A) 0 (B) 1 (C) 2 (D) 3

19. If $(x^2 - 2|x|)(|2x| - 2) - 9\left(\frac{2|x| - 2}{x^2 - 2|x|}\right) \le 0$ then
(A) $x \in (-\infty, -1] \cup (0,1] \cup (2,3]$ (B) $x \in (-\infty, -1] \cup (2,3] \cup \{1\}$
(C) $x \in (-\infty, 3]$ (D) $x \in [-3 - 2) \cup [-1,0) \cup (0,1] \cup (2,3]$

20. Number of solution of pair of equations $y = ||x| - 2| - 2|$ and $y = \frac{x+2}{2}$ equals to

(A) 1 (B) 2 (C) 3 (D) 4

21*. For making graph of equations $|y| = |f(|x|)|$ through $y = f(x)$ which order of step is right among the following order of

Step I : $y = f(|x|)$ (replace x by |x|)

Step II : $y = |f(x)|$ (take modulus of R.H.S)

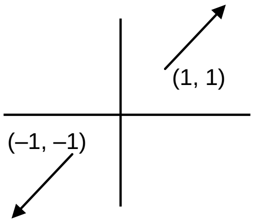
Step III : $|y| = f(x)$ (replace y by |y|)

(A) I, II, III (B) II, I, III (C) III, II, I (D) III, I, II

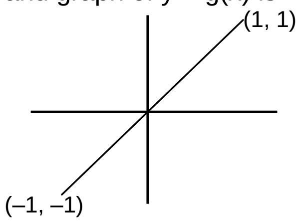
22. The sum of all the integral values of a {where $a \in [-10, 10)$} such that the graph of the function $f(x) = ||x - 2| - a| - 3$ has exactly three x-intercepts is

(A) 10 (B) 5 (C) 3 (D) 0

23. Let graph of $y = f(x)$ is



and graph of $y = g(x)$ is



The graph of $y = |f(x) + g(x)|$ is same as

(A) $y = |f(x)| + |g(x)|$ (B) $y = 2|x|$ (C) $y = |x|$ (D) $y = 2$

24. Complete set of solution of inequation $\frac{3}{\sqrt{2-x}} - \sqrt{2-x} < 2$ is

(A) $(-\infty,1)$ (B) $(-\infty,1]$ (C) $(1,\infty)$ (D) $[1,\infty)$

25. Complete set of solution of inequation $\sqrt{3x^2+5x+7} - \sqrt{3x^2+5x+2} > 1$ is $(-a, -b] \cup [-c,d)$ (where a, b, c $\in R^+$) then a + b + c + d equation

(A) 4 (B) 3 (C) 2 (D) 1

26. Complete set of solution of a inequation $\sqrt{x+2\sqrt{x-1}} + \sqrt{x-2\sqrt{x-1}} > \frac{3}{2}$

(A) $(-\infty,1)$ (B) $(-\infty,1]$ (C) $[1, \infty)$ (D) $(1, \infty)$

27. If a, b, c are distinct positive number but no one among them is equal to one and $\log_b a \ \log_c a + \log_a b \ \log_c b + \log_a c \ \log_b c = 3$, then value of abc is

(A) 2 (B) 3 (C) 0 (D) 1

28. Let α, β, are two real solution of equation $(\log_{10}x)^2 + \log_{10}x^2 = (\log_{10}2)^2 - 1$, then $\sqrt{\frac{1}{\alpha\beta}}$ equal to

(A) 20 (B) 3 (C) 10 (D) 1

29. Let a, b, c, d are positive integer such that $\log_a b = 3/2$ and $\log_c d = 5/4$. If a – c = 9, then value of (b – d) is equal to
(A) 20 (B) 93 (C) 10 (D) 1

30. The values of a for which the equation $2(\log_3 x)^2 - |\log_3 x| + a = 0$ posses four real solution
(A) $-2 < a < 0$ (B) $0 < a < \frac{1}{8}$ (C) $0 < a < 5$ (D) $-\frac{1}{8} < a < 0$

31. If $\log_{\frac{1}{2}}\frac{x^2+6x+9}{2(x+1)} < -\log_2(x+1)$ then complete set of values of x is
(A) $(-1, 1+2\sqrt{2})$ (B) $\left(1-2\sqrt{2}, 2\right)$ (C) $(-1, \infty)$ (D) $(1-2\sqrt{2}, 1+2\sqrt{2})$

32. The least positive integer x, which satisfies the inequality $\log_{\log_2\left(\frac{x}{2}\right)}(x^2 - 10x + 22) > 0$ is equal to
(A) 3 (B) 4 (C) 7 (D) 8

33. Complete set of solution of equation $\frac{\log_{0.3}(x-2)}{|x|} \geq 0$
(A) $[1, 2) \cup (2, 3]$ (B) $[1, 3]$ (C) $(2, 3]$ (D) $\{1\}$

34. The solution set of the inequality $|9^x - 3^{x+1} + 15| < 2.9^x - 3^x$ is
(A) $(-\infty, 1)$ (B) $(1, \infty)$ (C) $(-\infty, 1]$ (D) $[2, \infty)$

35. The complete set of values of x satisfying the equation $x^2 . 2^{x+1} + 2^{|x-3|+2} = x^2.2^{|x-3|+4} + 2^{x-1}$ is
(A) $[3, \infty)$ (B) $\left[-\frac{1}{2}, \frac{1}{2}\right] \cup (3, \infty)$ (C) $\left(-\infty - \frac{1}{2}\right)$ (D) $\left\{-\frac{1}{2}, \frac{1}{2}\right\} \cup [3, \infty)$

36. If $f(x) = \{x\} + \left\{x + \left[\frac{x}{1+x^2}\right]\right\} + \left\{x + \left[\frac{x}{1+2x^2}\right]\right\} + \left\{x + \left[\frac{x}{1+3x^2}\right]\right\} ....+ \left\{x + \left[\frac{x}{1+99x^2}\right]\right\}$, then values of $[f(\sqrt{3})]$ is (where [•] denotes greatest integer function and {•} represent fractional part function)
(A) 5050 (B) 4950 (C) 17 (D) 73

37. The number of solution of the equation sgn ({x}) = |1– x| is/are (where {•} represent fractional part function and sgn respresent signum function)
(A) 4 (B) 3 (C) 2 (D) 1

38. The complete set of solution of Inequality $\frac{x^2 - 5x + 6\,\text{sgn}(x)}{x\,\text{sgn}(x-1)+1} \geq 0$ is (where sgn respresent signum function)
(A) $(-\infty, -1] \cup [0,2] \cup [3,\infty)$ (B) $(-\infty, 0] \cup [2,\infty)$
(C) $(-\infty,2] \cup [3,\infty)$ (D) $(-\infty, -1] \cup [0,\infty)$

39. $\frac{1}{\sin 3\alpha}\left[\sin^3\alpha + \sin^3\left(\frac{2\pi}{3}+\alpha\right) + \sin^3\left(\frac{4\pi}{3}+\alpha\right)\right]$ is equal to
(A) $\frac{4}{3}$ (B) $\frac{3}{4}$ (C) $\frac{-3}{4}$ (D) $\frac{-4}{3}$

40.* If (m + 2) sinθ + (2m – 1) cosθ = 2m + 1 then
(A) $\tan\theta = \frac{3}{4}$ (B) $\tan\theta = \frac{2m}{m^2+1}$ (C) $\tan\theta = \frac{2m}{m^2-1}$ (D) $\tan\theta = \frac{4}{3}$

41. * Let $0 \le \theta \le \frac{\pi}{2}$ and x = X cosθ + Ysinθ , y = Xsinθ – Ycosθ such that $x^2 + 4xy + y^2 = aX^2 + bY^2$, where a, b are constants then

(A) a = –1, b = 3 (B) $\theta = \pi/4$ (C) a = 3, b = – 1 (D) $\theta = \frac{\pi}{3}$

42. Let $(1 + \tan 1^o)(1 + \tan 2^o)$ ....$(1 + \tan 45^o) = 2^k$ then k equals to

(A) 21 (B) 22 (C) 23 (D) 24

43. The number of solution of 2 cosx = |sinx| where $x \in [0,4\pi]$ is/are

(A) 2 (B) 3 (C) 4 (D) 1

44. * If the equation $\sin(\pi x^2) - \sin(\pi x^2 + 2\pi x) = 0$ is solved for positive roots, then in the increasing sequence of positive root

(A) first term is $\frac{-1+\sqrt{7}}{2}$ (B) first term is $\frac{-1+\sqrt{3}}{2}$

(C) third term is 1 (D) third term is $\frac{-1+\sqrt{11}}{2}$

45. In $(0, 6\pi)$, the number of solutions of the equation tanθ + tan 2θ + tan 3θ = tan θ.tan2θ.tan3θ is /are

(A) 15 (B) 17 (C) 20 (D) 12

46. If $2\tan^2 x - 5\sec x - 1 = 0$ has 7 different roots in $\left[0, \frac{n\pi}{2}\right]$, $n \in N$, then the greatest value of n is

(A) 15 (B) 13 (C) 14 (D) 16

47. The number of integral values of a for which the equation cos 2x + a sin x = 2a – 7 possesses a solution.

(A) 0 (B) 1 (C) 3 (D) 5

48. If the arithmetic mean of the roots of the equation $4\cos^3 x - 4\cos^2 x - \cos(\pi + x) - 1 = 0$ in the interval [0, 315] is equal to $k\pi$, then the value of k is

(A) 10 (B) 20 (C) 50 (D) 80

49. Number of solution of sinx cosx – 3 cosx + 4 sinx – 13 > 0 in $[0,2\pi]$ is equal to

(A) 0 (B) 1 (C) 2 (D) 4

50. The solution of $\sqrt{5 - 2\sin x} \ge 6 \sin x - 1$ is

(A) $[\pi(12n - 7)/6, \pi(12n + 7)/6]$ $(n \in Z)$ (B) $[\pi(12n - 7)/6, \pi(12n + 1)/6]$ $(n \in Z)$

(C) $[\pi(2n - 7)/6, \pi(2n + 1)/6]$ $(n \in Z)$ (D) $[\pi(12n - 7)/3, \pi(12n + 1)/3]$ $(n \in Z)$

Exercise-3

*** Marked Questions may have more than one correct option.**
Marked questions are recommended for Revision.

PART - I : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1.*✍ If $\frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5}$, then **[IIT-JEE - 2009 ,Paper-1, (4, –1), 80]**

(A) $\tan^2 x = \frac{2}{3}$
(B) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{1}{125}$
(C) $\tan^2 x = \frac{1}{3}$
(D) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

2*.✍ For $0 < \theta < \frac{\pi}{2}$, the solution(s) of $\sum_{m=1}^{6} \operatorname{cosec}\left(\theta + \frac{(m-1)\pi}{4}\right) \operatorname{cosec}\left(\theta + \frac{m\pi}{4}\right) = 4\sqrt{2}$ is(are)
[IIT-JEE - 2009, Paper-2, (4, –1), 80]

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{12}$ (D) $\frac{5\pi}{12}$

3. The maximum value of the expression $\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$ is
[IIT-JEE-2010, Paper-1, (3, 0)/84]

4.✍ The positive integer value of n > 3 satisfying the equation $\frac{1}{\sin\left(\frac{\pi}{n}\right)} = \frac{1}{\sin\left(\frac{2\pi}{n}\right)} + \frac{1}{\sin\left(\frac{3\pi}{n}\right)}$ is
[IIT-JEE-2010, Paper-1, (3, 0)/84]

5.✍ The number of values of θ in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ such that $\theta \neq \frac{n\pi}{5}$ for n = 0, ±1, ± 2 and $\tan\theta = \cot 5\theta$ as well as $\sin 2\theta = \cos 4\theta$ is **[IIT-JEE-2010, Paper-1, (3, 0)/84]**

6.✍ Let (x_0, y_0) be the solution of the following equations

$(2x)^{\square n2} = (3y)^{\square n3}$
$3^{\square nx} = 2^{\square ny}$.

Then x_0 is **[IIT-JEE 2011, Paper-1, (3, –1), 80]**

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) 6

7.✍ Let P = {θ : $\sin\theta - \cos\theta = \sqrt{2}\cos\theta$} and Q = {$\theta$: $\sin\theta + \cos\theta = \sqrt{2}\sin\theta$} be two sets. Then

(A) $P \subset Q$ and $Q - P \neq \varnothing$
(B) $Q \not\subset P$
(C) $P \not\subset Q$
(D) P = Q **[IIT-JEE 2011, Paper-1, (3, –1), 80]**

8.*✍ Let $\theta, \phi \in [0, 2\pi]$ be such that $2\cos\theta(1 - \sin\phi) = \left(\tan\frac{\theta}{2} + \cot\frac{\theta}{2}\right)\sin^2\theta \cos\phi - 1$, $\tan(2\pi - \theta) > 0$ and $-1 < \sin\theta < -\frac{\sqrt{3}}{2}$. Then ϕ cannot satisfy **[IIT-JEE 2012, Paper-1, (4, 0), 70]**

(A) $0 < \phi < \frac{\pi}{2}$ (B) $\frac{\pi}{2} < \phi < \frac{4\pi}{3}$ (C) $\frac{4\pi}{3} < \phi < \frac{3\pi}{2}$ (D) $\frac{3\pi}{2} < \phi < 2\pi$

9. The value of $6+\log_{\frac{3}{2}}\left(\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}....}}}\right)$ is **[IIT-JEE 2012, Paper-1, (4, 0), 70]**

10.* If $3^x = 4^{x-1}$, then x = **[JEE (Advanced) 2013, Paper-2, (3, –1)/60]**

(A) $\frac{2\log_3 2}{2\log_3 2-1}$ (B) $\frac{2}{2-\log_2 3}$ (C) $\frac{1}{1-\log_4 3}$ (D) $\frac{2\log_2 3}{2\log_2 3-1}$

11. For $x \in (0, \pi)$, the equation sinx + 2 sin 2x – sin 3x = 3 has **[JEE (Advanced) 2014, Paper-2, (3, –1)/60]**

(A) infinitely many solutions (B) three solutions
(C) one solution (D) no solution

12. The number of distinct solutions of the equation **[JEE (Advanced) 2015, P-1 (4, 0) /88]**

$\frac{5}{4}\cos^2 2x + \cos^4 x + \sin^4 x + \cos^6 x + \sin^6 x = 2$ in the interval $[0, 2\pi]$ is

13. Let $-\frac{\pi}{6} < \theta < -\frac{\pi}{12}$. Suppose α_1 and β_1 are the roots of the equation $x^2 - 2x\sec\theta + 1 = 0$ and α_2 and β_2 are the roots of the equation $x^2 + 2x\tan\theta - 1 = 0$. If $\alpha_1 > \beta_1$ and $\alpha_2 > \beta_2$, then $\alpha_1 + \beta_2$ equals

(A) $2(\sec\theta - \tan\theta)$ (B) $2\sec\theta$ (C) $-2\tan\theta$ (D) 0

[JEE (Advanced) 2016, Paper-1, (3, –1)/62]

14. Let S = $\left\{x \in (-\pi, \pi) : x \neq 0, \pm\frac{\pi}{2}\right\}$. The sum of all distinct solutions of the equation

$\sqrt{3}\sec x + \operatorname{cosec} x + 2(\tan x - \cot x) = 0$ in the set S is equal to

[JEE (Advanced) 2016, Paper-1, (3, –1)/62]

(A) $-\frac{7\pi}{9}$ (B) $-\frac{2\pi}{9}$ (C) 0 (D) $\frac{5\pi}{9}$

15. The value of $\sum_{k=1}^{13}\frac{1}{\sin\left(\frac{\pi}{4}+\frac{(k-1)\pi}{6}\right)\sin\left(\frac{\pi}{4}+\frac{k\pi}{6}\right)}$ is equal to **[JEE (Advanced) 2016, Paper-2 (3, –1)/62]**

(A) $3-\sqrt{3}$ (B) $2(3-\sqrt{3})$ (C) $2(\sqrt{3}-1)$ (D) $2(2+\sqrt{3})$

16. Let α and β be nonzero real numbers such that $2(\cos\beta - \cos\alpha) + \cos\alpha\cos\beta = 1$. Then which of the following is/are true? **[JEE(Advanced) 2017, Paper-2,(4, –2)/61]**

(A) $\sqrt{3}\tan\left(\frac{\alpha}{2}\right) - \tan\left(\frac{\beta}{2}\right) = 0$ (B) $\tan\left(\frac{\alpha}{2}\right) - \sqrt{3}\tan\left(\frac{\beta}{2}\right) = 0$

(C) $\tan\left(\frac{\alpha}{2}\right) + \sqrt{3}\tan\left(\frac{\beta}{2}\right) = 0$ (D) $\sqrt{3}\tan\left(\frac{\alpha}{2}\right) + \tan\left(\frac{\beta}{2}\right) = 0$

17. The value of $((\log_2 9)^2)^{\frac{1}{\log_2(\log_2 9)}} \times (\sqrt{7})^{\frac{1}{\log_4 7}}$ is ___________.**[JEE(Advanced) 2018, Paper-1,(3, 0)/60]**

PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then **[AIEEE-2009, (4, – 1), 144]**

(1) A = C (2) B = C (3) $A \cap B = \phi$ (4) A = B

2. Let A and B denote the statements **[AIEEE 2009 (4, –1), 144]**

A : $\cos \alpha + \cos \beta + \cos \gamma = 0$

B : $\sin \alpha + \sin \beta + \sin \gamma = 0$

If $\cos (\beta - \gamma) + \cos (\gamma - \alpha) + \cos (\alpha - \beta) = -\frac{3}{2}$, then :

(1) A is false and B is true (2) both A and B are true

(3) both A and B are false (4) A is true and B is false

3. Let $\cos(\alpha + \beta) = \frac{4}{5}$ and let $\sin(\alpha - \beta) = \frac{5}{13}$, where $0 \le \alpha, \beta \le \frac{\pi}{4}$. Then $\tan 2\alpha$ = **[AIEEE 2010 (4, –1), 144]**

(1) $\frac{56}{33}$ (2) $\frac{19}{12}$ (3) $\frac{20}{7}$ (4) $\frac{25}{16}$

4. If $A = \sin^2 x + \cos^4 x$, then for all real x : **[AIEEE 2011 (4, –1), 120]**

(1) $\frac{3}{4} \le A \le 1$ (2) $\frac{13}{16} \le A \le 1$ (3) $1 \le A \le 2$ (4) $\frac{3}{4} \le A \le \frac{13}{16}$

5. Let X = {1, 2, 3, 4, 5}. The number of different ordered pairs (Y, Z) that can formed such that $Y \subseteq X$, $Z \subseteq X$ and $Y \cap Z$ is empty, is : **[AIEEE-2012, (4, – 1), 120]**

(1) 5^2 (2) 3^5 (3) 2^5 (4) 5^3

6. In a ΔPQR, if 3 sin P + 4 cos Q = 6 and 4 sin Q + 3 cos P = 1, then the angle R is equal to : **[AIEEE-2012, (4, –1)/120]**

(1) $\frac{5\pi}{6}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{4}$ (4) $\frac{3\pi}{4}$

7. Let A and B two sets containing 2 elements and 4 elements respectively. The number of subsets of A × B having 3 or more elements is **[AIEEE - 2013, (4, –1), 120]**

(1) 256 (2) 220 (3) 219 (4) 211

8. The expression $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ can be written as : **[AIEEE - 2013, (4, –1),120]**

(1) sinA cosA + 1 (2) secA cosecA + 1 (3) tanA + cotA (4) secA + cosecA

9. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9(n - 1) : n \in N\}$, where N is the set of natural numbers, then $X \cup Y$ is equal to **[JEE(Main)2014,(4, – 1), 120]**

(1) X (2) Y (3) N (4) Y – X

10. Let $f_k(x) = \frac{1}{k}(\sin^k x + \cos^k x)$ where $x \in R$ and $k \geq 1$. Then $f_4(x) - f_6(x)$ equals

[JEE(Main)2014,(4, – 1), 120]

(1) $\frac{1}{4}$ (2) $\frac{1}{12}$ (3) $\frac{1}{6}$ (4) $\frac{1}{3}$

11. Let A and B be two sets containing four and two elements respectively. Then the number of subsets of the set A × B, each having at least three elements is: **[JEE(Main)2015,(4, –1), 120]**

(1) 219 (2) 256 (3) 275 (4) 510

12. If the angles of elevation of the top of a tower from three collinear points A, B and C, on a line leading to the foot of the tower, are 30º, 45º and 60º respectively, then the ratio, AB : BC , is

[JEE(Main)2015,(4, – 1), 120]

(1) $\sqrt{3}:1$ (2) $\sqrt{3}:\sqrt{2}$ (3) $1:\sqrt{3}$ (4) 2 : 3

13. If $0 \leq x < 2\pi$, then the number of real values of x, which satisfy the equation
$\cos x + \cos 2x + \cos 3x + \cos 4x = 0$, is **[JEE Main 2016, (4, –1),120]**

(1) 5 (2) 7 (3) 9 (4) 3

14. If $5(\tan^2 x - \cos^2 x) = 2\cos 2x + 9$, then the value of $\cos 4x$ is : **[JEE Main 2017, (4, –1),120]**

(1) $\frac{-3}{5}$ (2) $\frac{1}{3}$ (3) $\frac{2}{9}$ (4) $-\frac{7}{9}$

15. Let a vertical tower AB have its end A on the level ground. Let C be the mid-point of AB and P be a point on the ground such that AP = 2AB. If $\angle BPC = \beta$, then $\tan\beta$ is equal to

[JEE Main 2017, (4, –1),120]

(1) $\frac{6}{7}$ (2) $\frac{1}{4}$ (3) $\frac{2}{9}$ (4) $\frac{4}{9}$

16. Let $S = \{x \in R : x \geq 0 \text{ and } 2|\sqrt{x} - 3| + \sqrt{x}(\sqrt{x} - 6) + 6 = 0\}$. Then S : **[JEE Main 2017, (4, –1),120]**

(1) contains exactly two elements. (2) contains exactly four elements.
(3) is an empty set. (4) contains exactly one element

17. If sum of all the solutions of the equation $8\cos x.\left(\cos\left(\frac{\pi}{6}+x\right).\cos\left(\frac{\pi}{6}-x\right)-\frac{1}{2}\right) = 1$ in $[0, \pi]$ is $k\pi$, then k is equal to : **[JEE(Main)2018,(4, – 1), 120]**

(1) $\frac{8}{9}$ (2) $\frac{20}{9}$ (3) $\frac{2}{3}$ (4) $\frac{13}{9}$

18. PQR is a triangular park with PQ = PR = 200 m. A T.V. tower stands at the mid-point of QR. If the angles of elevation of the top of the tower at P, Q and R are respectively 45º, 30º and 30º, then the height of the tower (in m) is : **[JEE(Main)2018,(4, – 1), 120]**

(1) $100\sqrt{3}$ (2) $50\sqrt{2}$ (3) 100 (4) 50

19. Let $S = \{x \in R : x \geq 0 \text{ and } 2|\sqrt{x} - 3| + \sqrt{x}(\sqrt{x} - 6) + 6 = 0\}$. Then S : **[JEE(Main)2018,(4, – 1), 120]**

(1) contains exactly two elements. (2) contains exactly four elements.
(3) is an empty set. (4) contains exactly one element

20. In a class 140 students numbered 1 to 140, all even numbered students opted Mathematics course, those whose number is divisible by 3 opted Physics course and those whose number is divisible 5 opted Chemistry course. Then the number of student who **did not** opt for any of the three courses is :

[JEE(Main) 2019, Online (10-01-19),P-1 (4, – 1), 120]

(1) 38 (2) 42 (3) 102 (4) 1

21. The sum of all values of $\theta \in \left(0, \frac{\pi}{2}\right)$ satisfying $\sin^2 2\theta + \cos^4 2\theta = \frac{3}{4}$ is :

[JEE(Main) 2019, Online (10-01-19),P-1 (4, – 1), 120]

(1) π (2) $\frac{\pi}{2}$ (3) $\frac{3\pi}{8}$ (4) $\frac{5\pi}{4}$

22. The value of $\cos\frac{\pi}{2^2}.\cos\frac{\pi}{2^3}. \ldots. .\cos\frac{\pi}{2^{10}}.\sin\frac{\pi}{2^{10}}$ is :

[JEE(Main) 2019, Online (10-01-19),P-2 (4, – 1), 120]

(1) $\frac{1}{1024}$ (2) $\frac{1}{2}$ (3) $\frac{1}{512}$ (4) $\frac{1}{256}$

23. If $\sin^4\theta + 4\cos^4\beta + 2 = 4\sqrt{2}\sin\alpha\cos\beta$; $\alpha, \beta \in [0, \pi]$, then $\cos(\alpha+\beta) - \cos(\alpha-\beta)$ is equal to

[JEE(Main) 2019, Online (12-01-19),P-2 (4, – 1), 120]

(1) $-\sqrt{2}$ (2) 0 (3) $\sqrt{2}$ (4) -1

Answers

EXERCISE # 1

Section (A) :

A-1. (iv) **A-2.** {2,3,5,7}

A-3. (i) non-empty (ii) empty (iii) non-empty (iv) non-empty

A-4. (i) Finite (ii) Infinite (iii) Finite (iv) Finite

A-5. 32 **A-6.** P(A) = {ϕ, {ϕ}, {{ϕ}}, {ϕ, {ϕ}}} = {ϕ, {ϕ}, {{ϕ}}, A}

Section (B) :

B-1. 6 **B-2.** {1, 2, 3, 4}

B-3. {x : $1 \le x < 2$}
(3) {x : $1 \le x \le 2$}
(4) {x : $1 < x < 2$}

B-4. {3, 5, 9} **B-5.** {3, 4, 10} **B-7.** {9, 21} **B-8.** d = bc

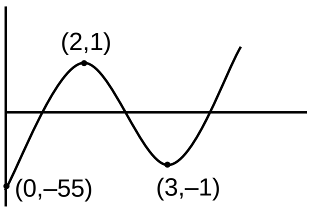
Section (C) :

C-1. 300 **C-2.** (i) 600 (ii) 250 (iii) 150 **C-3.** 60 **C-4.** 15

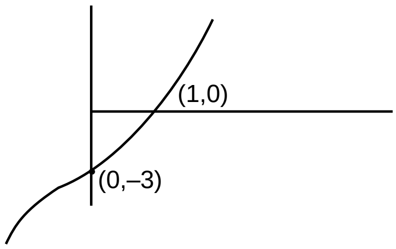
C-5. (i) 12 (ii) 6

Section (D) :

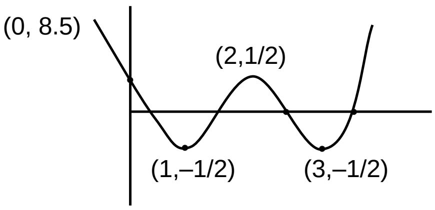
D-1. (i)



(ii)



(iii)



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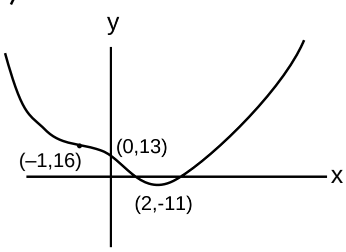
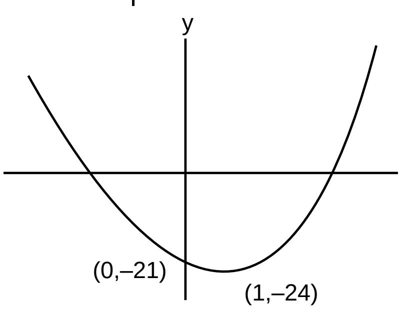


(v)



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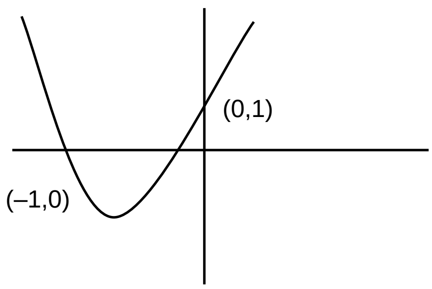


D-2. 2 **D-3.** $\left(\frac{-32}{27}, 0\right)$

Section (E) :

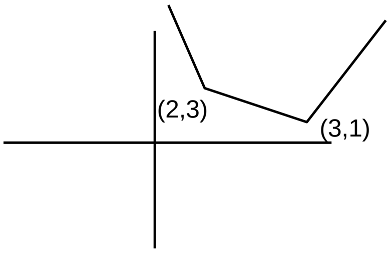
E-1. (i) $(-3,-2) \cup (1,3)$ (ii) $\{-2\} \cup [1, 8)$ (iii) $\left(-2, \frac{3-\sqrt{5}}{2}\right] \cup \left(1, \frac{3+\sqrt{5}}{2}\right]$

(iv) $(-\infty,1) - \{0\}$ (v) $(-3,-2) \cup (-1,\infty)$ (vi) $[1,6]$

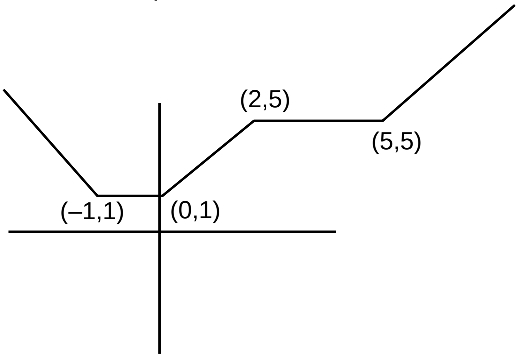
E-2. 2

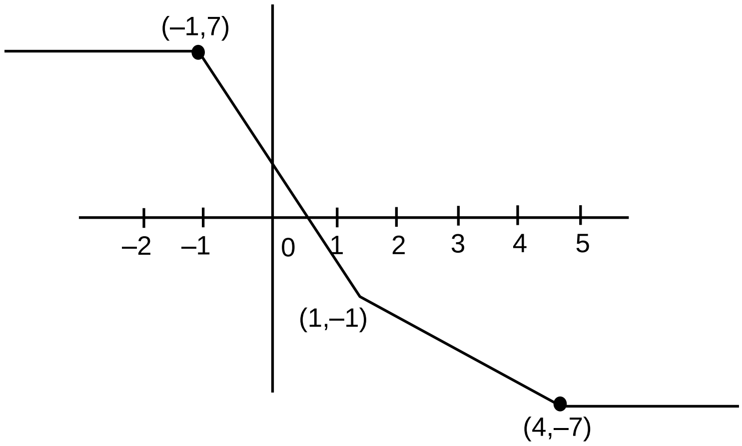
E-3. (i) $\left(-\infty, -\frac{5}{2}\right)$ (ii) $\left(\frac{25}{4}, \infty\right)$ (iii) $\left(-\frac{2}{5}, 0\right)$

E-4. (i) $y = \begin{cases} -4x+11 & x \in (-\infty,2) \\ -2x+7 & x \in [2,3) \\ 4x-11 & x \in [3,\infty) \end{cases}$



(ii) $\begin{cases} -2x-1 & x \in (-\infty,-1) \\ 1 & x \in [-1,0) \\ 2x+1 & x \in [0,2) \\ 5 & x \in [2,5) \\ 2x-5 & x \in [5,\infty) \end{cases}$





(iii)

E-5. (i) $-\frac{2}{3}$ (ii) -2 (iii) $\frac{1}{3}, \frac{13}{4}$ (iv) $-\frac{9}{7}$

(v) $2, \frac{1 \pm \sqrt{7}}{3}$

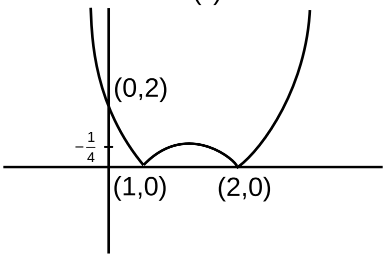
E-6. (i) $-2, 1$ (ii) $[3,\infty)$ (iii) $[-1,1] \cup [2,\infty)$

E-7. (i) $(-\infty,-12) \cup (-2,\infty)$ (ii) $(-13,7)$

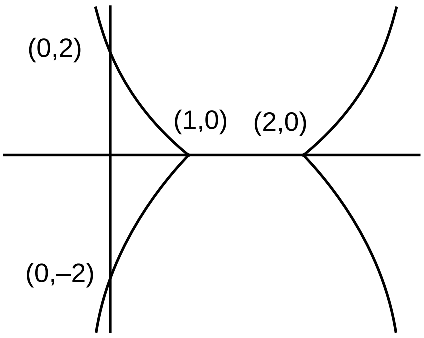
(iii)	R	(iv)	$\left(\frac{3}{4},1\right) \cup (1, \infty)$
(v)	$(-\infty,1] \cup [3,\infty)$	(vi)	$(-\infty,3)$
(vii)	$(-7,-2) \cup (3,4)$	(viii)	$[0,4]$

E-8. (i) 5 (ii) 4

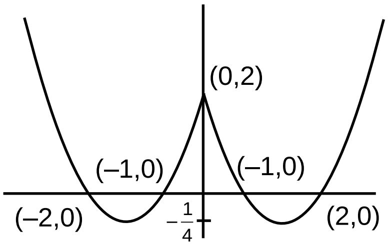
E-9. (i)



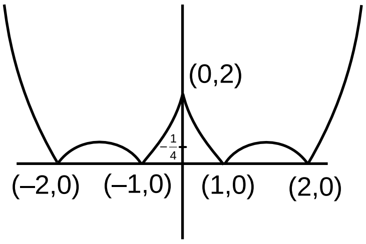
(ii)



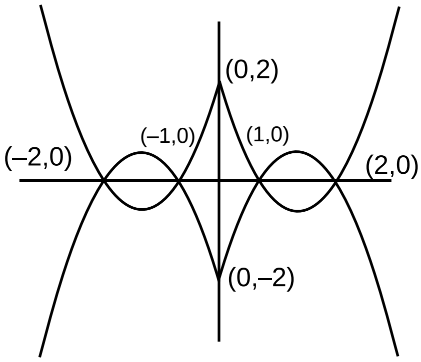
(iii)



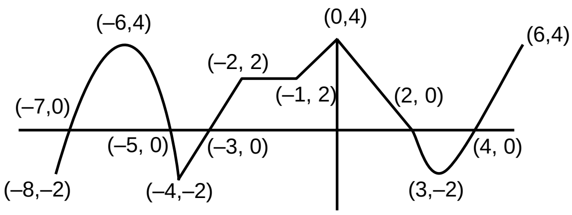
(iv)



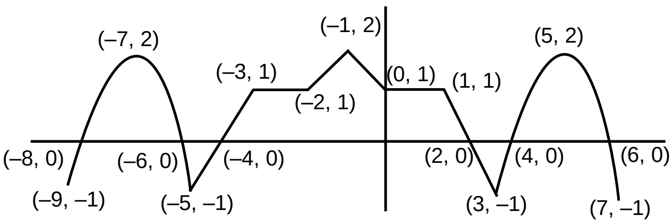
(v)



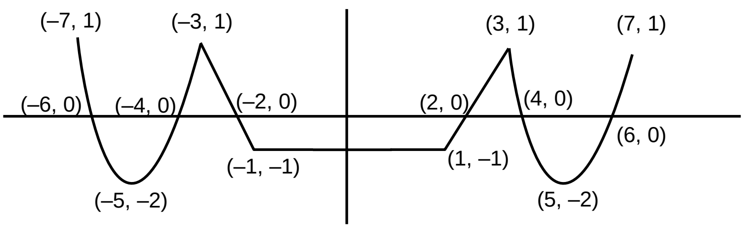
E-10. (i)



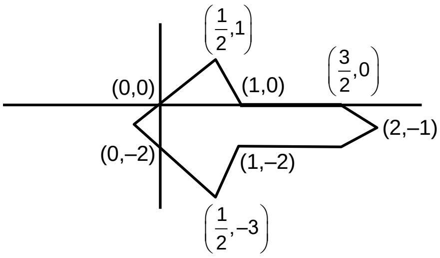
(ii)



(iii)



(iv)



Section (F) :

F-1. (i) $(5, \infty)$ (ii) $(5,7]$ (iii) R (iv) $x \in \phi$ (v) $(-\infty,2) \cup (8, \infty)$

(vi) $(-\infty,-2)$ (vii) $x \in \left(0,\frac{1}{3}\right]$ (viii) $x \in (-\infty,-4) \cup \left[\frac{1}{2},\frac{8}{7}\right]$ (ix) $x \in [-1,2)$

F-2. (i) 1 (ii) 2 (iii) 1

(iv) –72 (v) $7 + \frac{1}{196}$ (vi) 0

F-3. (i) $\frac{1}{a}+\frac{4}{3b}$ (ii) $\frac{1}{2}\left(\frac{2b+1-a}{2b+4a}\right)$

F-5 (i) 3 (ii) 5 (iii) ± 3 (iv) 3

F-6. (i) 0 (ii) $10, 10^{-4}$ (iii) $10, 10^{-9/2}$ (iv) 10, 3/2 (v) 1

F-7 (i) $\left(\frac{1}{3},2\right)$ (ii) $\left[\frac{1}{2},4\right]$ (iii) $[2,\infty)$ (iv) $(-\infty, -2] \cup [2, \infty)$

F-8. (i) $\left(\frac{1}{3^{3/2}},\infty\right)$ (ii) $[\log_3 9/10,2)$ (iii) $(5, \infty)$ (iv) $(2,\infty)$

F-9 (i) R (ii) (0, $\log_{\frac{3}{2}} 3$)

Section (G) :

G-1. (i) $x \in \left[\frac{1}{2},1\right)$ (ii) 2 (iii) $x \in \bigcup_{n\in I}\left\{n+\frac{1}{3},n+\frac{1}{2}\right\}$ (iv) $x \in [1,2)$

G-2 (i) $x \in \phi$ (ii) {0} (iii) {0,2/5, –1/5}

G-3. (i) no solution (ii) $-1, -\frac{1}{2}$ (iii) 0,1

G-4. (i) $x \in (-\infty,0)$ (ii) $x \in \left(\frac{-1}{2},1\right)$ (iii) $x \in \bigcup_{n\in I}\left[n,n+\frac{1}{2}\right)$

G-5 (i) $x \in R$ (ii) $x \in (-2, 4)$ (iii) $(1, 2) \cup (2, 3) \cup (3, 4)$ **G-6** (i) 2 (ii) 2

Section (H) :

H-1. (i) $\frac{\pi}{3}, \frac{-\pi}{3}$ (ii) $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{2\pi}{9}, \frac{4\pi}{9}, \frac{8\pi}{9}$ (iii) $\frac{\pi}{6}$

H-2. (i) $x = \frac{n\pi}{4}$ or $x = m\pi \pm \frac{\pi}{6}$ where $m, n \in I$

(ii) $x = (2n+1)\frac{\pi}{10}$ where $n \in I$

(iii) $x = m\pi$, $m \in I$

H-3. (i) $x \in \bigcup_{n\in I}\left(\frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi\right)$ (ii) $x \in \bigcup_{n\in I} [\frac{-\pi}{2} + 2n\pi, \frac{-\pi}{3} + 2n\pi] \cup [\frac{\pi}{3} + 2n\pi, \frac{\pi}{2} + 2n\pi]$

(iii) $x \in \bigcup_{n\in I} [-\frac{\pi}{6} + 2n\pi, 2n\pi + \frac{\pi}{2}]$ (iv) $x \in R$ (v) $x \in \bigcup_{n\in I}\left(-\frac{\pi}{2} + 2n\pi, -\frac{\pi}{3} + 2n\pi\right) \cup \left(\frac{\pi}{3} + 2n\pi, \frac{\pi}{2} + 2n\pi\right)$

H-4 (i) 11 (ii) 6 **H-5.** $y = \frac{1}{2}$ and $x = n\pi$, where $n \in I$

EXERCISE # 2

1.	(A)	**2.**	(D)	**3.**	(A)	**4.**	(D)	**5.**	(C)	**6.**	(B)	**7.**	(A)
8.	(B)	**9.**	(C)	**10.**	(C)	**11.**	(C)	**12.**	(B)	**13.***	(AD)	**14.**	(C)
15.	(A)	**16.**	(C)	**17.**	(B)	**18.**	(A)	**19.**	(D)	**20.**	(C)	**21*.**	(B)
22.	(C)	**23.**	(A)	**24.**	(A)	**25.**	(A)	**26.**	(C)	**27.**	(D)	**28.**	(C)
29.	(B)	**30.**	(B)	**31.**	(A)	**32.**	(D)	**33.**	(C)	**34.**	(B)	**35.**	(D)
36.	(D)	**37.**	(D)	**38.**	(A)	**39.**	(C)	**40.***	(CD)	**41. ***	(BC)	**42.**	(C)
43.	(C)	**44. ***	(BC)	**45.**	(B)	**46.**	(A)	**47.**	(D)	**48.**	(C)	**49.**	(A)
50.	(B)												

EXERCISE # 3

PART-I

1.*	(AB)	**2*.**	(CD)	**3.**	2	**4.**	(n = 7)	**5.**	3	**6.**	(C)	**7.**	(D)
8.*	(ACD)	**9.**	(4)	**10.***	(ABC)	**11.**	(D)	**12.**	8	**13.**	(C)	**14.**	(C)
15.	(C)	**16.**	(BC)/ BONUS			**17.**	(8)						

PART-II

1.	(2)	**2.**	(2)	**3.**	(1)	**4.**	(1)	**5.**	(2)	**6.**	(2)	**7.**	(3)
8.	(2)	**9.**	(2)	**10.**	(2)	**11.**	(1)	**12.**	(1)	**13.**	(2)	**14.**	(4)
15.	(3)	**16.**	(1)	**17.**	(4)	**18.**	(3)	**19.**	(1)	**20.**	(1)	**21.**	(2)
22.	(3)	**23.**	(1)										