



- c)  $\frac{3}{\sqrt{27}}$  d)  $\frac{3}{\sqrt{19}}$
6. For the differential equation  $xy \frac{dy}{dx} = (x+2)(y+2)$  find the solution curve passing through the point (1, -1). [1]  
 a)  $y + x + 2 = \log(x^2(y+2)^2)$  b)  $y - x - 2 = \log(x^2(y-2)^2)$   
 c)  $y - x + 2 = \log(x^2(y+2)^2)$  d)  $y - x - 2 = \log(x^2(y+2)^2)$
7. The value of objective function is maximum under linear constraints [1]  
 a) at (0, 0) b) at any vertex of feasible region  
 c) the vertex which is maximum distance from (0, 0) d) at the centre of feasible region
8. Let a vector  $\vec{r}$  make angles  $60^\circ, 30^\circ$  with X and Y-axes, respectively. What are the direction cosines of  $\vec{r}$ ? [1]  
 a)  $\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0 \rangle$  b)  $\langle \frac{1}{2}, \frac{\sqrt{3}}{2}, 0 \rangle$   
 c)  $\langle -\frac{1}{2}, \frac{\sqrt{3}}{2}, 0 \rangle$  d)  $\langle \frac{1}{2}, -\frac{\sqrt{3}}{2}, 0 \rangle$
9. If  $\int_0^a \frac{1}{1+4x^2} dx = \frac{\pi}{8}$ , then a equals [1]  
 a) 1 b)  $\frac{\pi}{4}$   
 c)  $\frac{1}{2}$  d)  $\frac{\pi}{2}$
10. If  $(2A - B) = \begin{bmatrix} 6 & -6 & 0 \\ -4 & 2 & 1 \end{bmatrix}$  and  $(2B + A) = \begin{bmatrix} 3 & 2 & 5 \\ -2 & 1 & -7 \end{bmatrix}$  then A = ? [1]  
 a) None of these b)  $\begin{bmatrix} -3 & 2 & 1 \\ 2 & 1 & -1 \end{bmatrix}$   
 c)  $\begin{bmatrix} 3 & -2 & 1 \\ -2 & 1 & -1 \end{bmatrix}$  d)  $\begin{bmatrix} 3 & 2 & -1 \\ 2 & -1 & 1 \end{bmatrix}$
11. Which of the following is not a convex set? [1]  
 a)  $\{(x, y) : 2x + 5Y < 7\}$  b)  $\{(x, y) : x^2 + y^2 \leq 4\}$   
 c)  $\{X : |X| = 5\}$  d)  $\{(x, y) : 3x^2 + 2y^2 \leq 6\}$
12. ABCD is a parallelogram and P is the point of intersection of the diagonals. If O is the origin, then  $OA + OB + OC + OD$  is equal to [1]  
 a) OP b) 4OP  
 c) 2OP d) Null vector
13. If  $I_3$  is the identity matrix of order 3, then  $I_3^{-1}$  is [1]  
 a) 0 b)  $3I_3$   
 c)  $I_3$  d) None of these
14. If E and F are independent, then \_\_\_\_\_ [1]  
 a)  $P(E \cap F) = P(E)P(F|E)$  b)  $P(E \cap F) = P(E)P(F)$   
 c)  $P(E \cap F) = P(E)P(F|E)$  d)  $P(E \cap F) = P(E \cup F)$
15. The degree of the differential equation  $\left(\frac{d^2y}{dx^2}\right)^2 - \left(\frac{dy}{dx}\right) = y^3$ , is [1]  
 a) 4 b)  $\frac{1}{2}$

- c) 2 d) 3
16. Two adjacent sides of a parallelogram are represented by the vectors  $\vec{a} = (3\hat{i} + \hat{j} + 4\hat{k})$  and  $\vec{b} = (\hat{i} - \hat{j} + \hat{k})$  [1]  
the area of the parallelogram is
- a) 6 sq units b)  $\sqrt{42}$   
c) none of these d)  $\sqrt{35}$
17. Let  $g(x) = \begin{cases} e^{2x}, & x < 0 \\ e^{-2x}, & x \geq 0 \end{cases}$  then  $g(x)$  does not satisfy the condition [1]
- a) none of these b) continuous  $\forall x \in \mathbb{R}$   
c) continuous  $\forall x \in \mathbb{R}$  and non differentiable d) not differentiable at  $x = 0$   
at  $x = \pm 1$
18. The vector equation of the x-axis is given by [1]
- a)  $\vec{r} = \hat{j} + \hat{k}$  b) none of these  
c)  $\vec{r} = \hat{i}$  d)  $\vec{r} = \lambda \hat{i}$
19. **Assertion (A):** If  $x$  is real, then the minimum value of  $x^2 - 8x + 17$  is 1. [1]  
**Reason (R):** If  $f''(x) > 0$  at a critical point, then the value of the function at the critical point will be the minimum value of the function.
- a) Both A and R are true and R is the correct b) Both A and R are true but R is not the  
explanation of A. correct explanation of A.  
c) A is true but R is false. d) A is false but R is true.
20. **Assertion (A):** The relation R in the set  $A = (1, 2, 3, 4)$  defined as  $R = \{(x, y): y \text{ is divisible by } x\}$  is an [1]  
equivalence relation.  
**Reason (R):** A relation R on the set A is equivalence if it is reflexive, symmetric and transitive.
- a) Both A and R are true and R is the correct b) Both A and R are true but R is not the  
explanation of A. correct explanation of A.  
c) A is true but R is false. d) A is false but R is true.

### Section B

21. Find the principal value of  $\operatorname{cosec}^{-1}(-2)$ . [2]  
OR  
Evaluate:  $\sin^{-1}(\sin(-600^\circ))$
22. Find the interval in which the function  $f(x) = x^3 - 6x^2 - 36x + 2$  is increasing or decreasing. [2]
23. An edge of a variable cube is increasing at the rate of 10 cm/sec. How fast the volume of the cube is increasing [2]  
when the edge is 5 cm long?
- OR
- Show that function  $x^2 - x + 1$  is neither increasing nor decreasing on  $(0,1)$
24. Evaluate:  $\int \sin \sqrt{x} dx$  [2]
25. A man 160 cm tall, walks away from a source of light situated at the top of a pole 6 m high, at the rate of 1.1 [2]  
m/sec. How fast is the length of his shadow increasing when he is 1 m away from the pole?

### Section C

26. Evaluate:  $\int_0^{\pi/2} \frac{\cos x}{1+\cos x+\sin x} dx$  [3]
27. Three persons A, B and C apply for a job of Manager in a private company. Chances of their selection (A, B and C) are in the ratio 1:2:4. The probabilities that A, B and C can introduce changes to improve profits of the company are 0.8, 0.5 and 0.3, respectively. If the change does not take place, find the probability that it is due to the appointment of C. [3]
28. Evaluate:  $\int_0^a \sqrt{a^2 - x^2} dx$  [3]

OR

Evaluate  $\int \frac{\sin(x-a)}{\sin(x+a)} dx$ .

29. Find the particular solution of the differential equation  $x \frac{dy}{dx} + y + \frac{1}{1+x^2} = 0$ , given that  $y(1) = 0$ . [3]

OR

Find the particular solution of the differential equation  $\cos x \frac{dy}{dx} + y = \sin x$ , given that  $y = 2$  when  $x = 0$ .

30. Solve the following LPP by graphical method: [3]

Minimize  $Z = 20x + 10y$

Subject to

$$x + 2y \leq 40$$

$$3x + y \geq 30$$

$$4x + 3y \geq 60$$

$$\text{and } x, y \geq 0$$

OR

Maximize  $Z = 100x + 170y$  subject to

$$3x+2y \leq 3600$$

$$x+4y \leq 1800$$

$$x \geq 0, y \geq 0$$

31. If  $x = a(\cos t + \log \tan \frac{t}{2})$ ,  $y = a \sin t$ , then evaluate  $\frac{d^2y}{dx^2}$  at  $t = \frac{\pi}{3}$ . [3]

#### Section D

32. If the area bounded by the parabola  $y^2 = 16ax$  and the line  $y = 4mx$  is  $\frac{a^2}{12}$  sq. units, then using integration, find the value of  $m$ . [5]
33. Let A and B be two sets. Show that  $f: A \times B \rightarrow B \times A$  such that  $f(a, b) = (b, a)$  is a bijective function. [5]

OR

Let  $A = \mathbb{R} - \{3\}$  and  $B = \mathbb{R} - \{1\}$ . Consider the function  $f: A \rightarrow B$  defined by  $f(x) = \left(\frac{x-2}{x-3}\right)$  Is  $f$  one-one and onto?

Justify your answer.

34. Two schools P and Q want to award their selected students on the values of Tolerance, Kindness, and Leadership. The school P wants to award Rs  $x$  each, Rs  $y$  each and Rs  $z$  each for the three respective values to 3, 2 and 1 students respectively with total award money of Rs2200. School Q wants to spend Rs 3100 to award its 4, 1 and 3 students on the respective values (by giving the same award money to the three values as school P). If the total amount of award for one prize on each value is Rs1200, using matrices, find the award money for each value. [5]

35. Find the shortest distance between the given lines.  $\vec{r} = (6\hat{i} + 3\hat{k}) + \lambda(2\hat{i} - \hat{j} + 4\hat{k})$ ,  $\vec{r} = (-9\hat{i} + \hat{j} - 10\hat{k}) + \mu(4\hat{i} + \hat{j} + 6\hat{k})$  [5]

OR

Find the image of the point (5, 9, 3) in the line  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$

#### Section E

36. **Read the text carefully and answer the questions:**

[4]

Akash and Prakash appeared for first round of an interview for two vacancies. The probability of Nisha's selection is  $\frac{1}{3}$  and that of Ayushi's selection is  $\frac{1}{2}$ .



- (i) Find the probability that both of them are selected.
- (ii) The probability that none of them is selected.
- (iii) Find the probability that only one of them is selected.

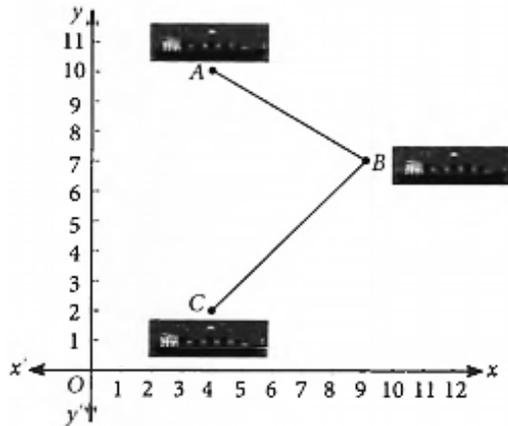
**OR**

Find the probability that atleast one of them is selected.

37. **Read the text carefully and answer the questions:**

[4]

A barge is pulled into harbour by two tug boats as shown in the figure.



- (i) Find position vector of A.
- (ii) Find position vector of B.
- (iii) Find the vector  $\vec{AC}$  in terms of  $\hat{i}, \hat{j}$ .

**OR**

If  $\vec{A} = 4\hat{i} + 3\hat{j}$  and  $\vec{B} = 3\hat{i} + 4\hat{j}$ , then find  $|\vec{A}| + |\vec{B}|$

38. **Read the text carefully and answer the questions:**

[4]

In an elliptical sport field, the authority wants to design a rectangular soccer field with the maximum possible area. The sport field is given by the graph of  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$



- (i) If the length and the breadth of the rectangular field be  $2x$  and  $2y$  respectively, then find the area function in terms of  $x$ .
- (ii) Find the critical point of the function.

**TO GET THE SOLUTION OF THIS PAPER AT RS 25 CLICK HERE**

**<https://cbsestudymaterial.myinstamojo.com/product/4764712/sample-paper-3-solution-maths/>  
To get free test papers and important Class 12 Maths questions join the group using link below  
<https://t.me/+0aGKP9p4HcNkOTII>**