

Practice Questions 2021-22
Class XII (Term 2)

Subject: Mathematics (041)

Time: 2 hours

Max. marks: 40

General instructions:

1. The question paper has three sections. Each part is compulsory.
2. Section-A has 6 questions of 2 marks each; Section-B has 4 questions of 3 marks each; and Section-C has 4 questions of 4 marks each.
3. Internal choices have been provided in some questions.
4. Q14 is a case-based problem having 2 sub parts.

SECTION A

1. Study the equation given below.

$$\int f(y) dy = \log_e \left(y + \frac{1}{y} \right)$$

Find $f(y)$. Show your steps.

OR

Integrate:

$$\int \frac{\sin a \cos a}{2 \cos^2 a - 1} da$$

Show your steps.

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2. Shown below is a differential equation.

$$y = e^{\sin\left(\frac{d^3y}{dx^3}\right)^2 + \left(\frac{dy}{dx}\right)^4}$$

Find the order and the degree of the given differential equation. Give reasons to support your answer.

3. Shown below are two vectors in their component forms.

$$\vec{u} = 3\hat{i} - p\hat{j} + 5\hat{k}$$

$$\vec{v} = -6\hat{i} + 14\hat{j} + q\hat{k}$$

For what values of p and q are the vectors collinear? Show your steps.

4. A(-1, 3, 2), B(-2, 3, -1), C(-5, -4, p) and D(-2, -4, 3) are four points in space. Lines AB and CD are parallel.

Find the value of p . Show your work and give valid reasons.

5. Bhavani is going to play a game of chess against one of four opponents in an intercollege sports competition. Each opponent is equally likely to be paired against her. The table below shows the chances of Bhavani losing, when paired against each opponent.

Opponent	Opponent 1	Opponent 2	Opponent 3	Opponent 4
Bhavani's chances of losing	12%	60%	x %	84%

If the probability that Bhavani loses the game that day is $\frac{1}{2}$, find the probability for Bhavani to be losing the game when paired against Opponent 3. Show your steps.

6. In the game of archery, the probability of Likith and Harish hitting the target are $\frac{2}{3}$ and $\frac{3}{4}$ respectively.

If both of them shoot an arrow, find the probability that the target is NOT hit by either of them. Show your steps.

SECTION B

7. The first derivative of a function $f(x)$ is given below.

$$\frac{e^x (x - 1)}{x^2}$$

If $f(1) = e + 3$, find $f(x)$. Show your steps.

8. Find the general solution of the differential equation given below.

$$\frac{dy}{dx} = \frac{1}{x(1+x^2)}$$

Show your steps.

OR

Shown below is a differential equation where the value of y is 0 when $x = 3$.

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2 \log x}$$

Find the value of y when $x = 5$. Show your steps.

9. Three vertices - A, B and D of a parallelogram ABCD are given by, A(0, -3, 3), B(-5, $m - 3$, 0) and D(1, -3, 4). The area of the parallelogram ABCD is 6 sq units.

Using the vector method, find the value(s) of m . Show your steps.

OR

\vec{r} and \vec{s} are unit vectors. If $|\vec{r} + \vec{s}| = \sqrt{2}$, find:

i) the value of $(4\vec{r} - \vec{s}) \cdot (2\vec{r} + \vec{s})$.

ii) the angle between \vec{r} and \vec{s} .

Show your steps.

10. The vector form of equations of two lines, l_1 and l_2 are:

$$l_1: \vec{r} = 2\hat{i} - \hat{k} + \lambda(-2\hat{j} + \hat{k})$$

$$l_2: \vec{r} = \hat{i} + 3\hat{j} + 2\hat{k} + \mu(\hat{i} - 2\hat{k})$$

Show that l_1 and l_2 are skew lines.

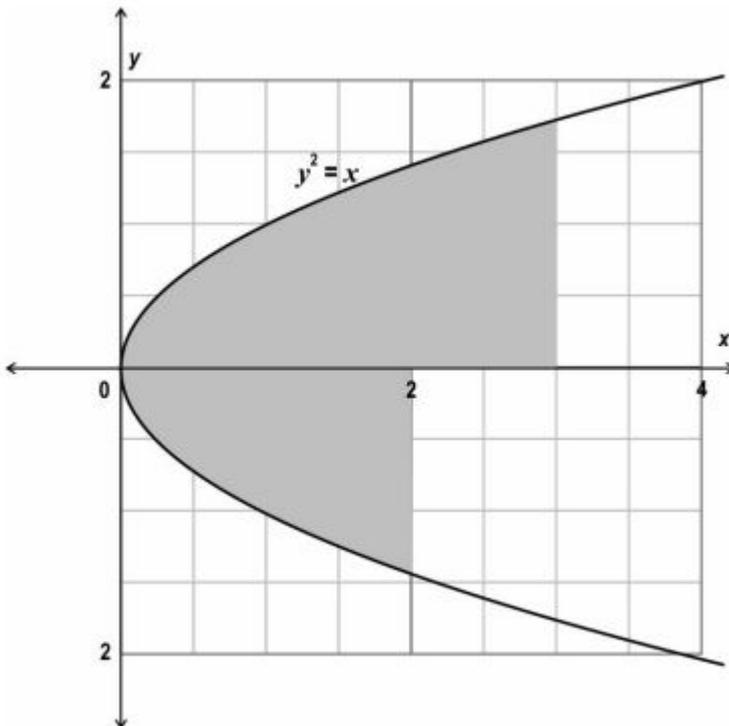
SECTION C

11. Evaluate:

$$\int_2^5 \frac{dx}{4x^2 - 8x + 3}$$

Show your steps.

12. Shown below is a parabola.

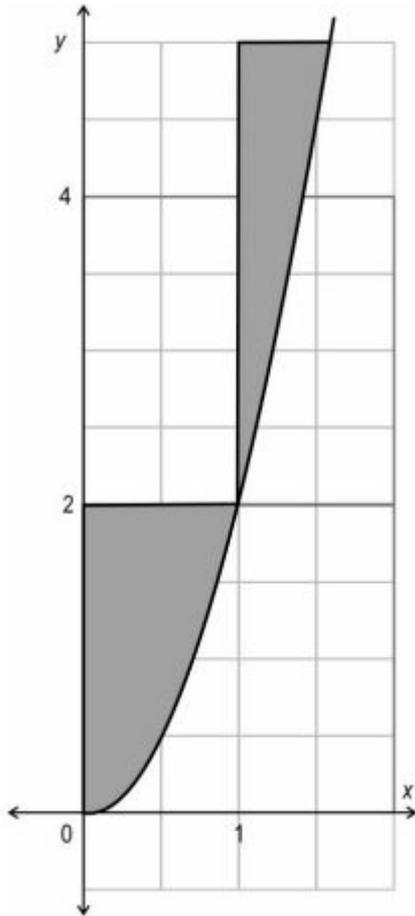


Find the area of the shaded region. Show your steps.

(Note: Take $\sqrt{2}$ as 1.4 and $\sqrt{3}$ as 1.7.)

OR

Shown below is the graph of $f(x) = 2x^2$ in the first quadrant.



Find the area of the shaded region. Show your steps.

(Note: You need not evaluate the square roots.)

13. Shown below are equations of two planes.

Plane 1: $-6x - 3y - 2z = 12$

Plane 2: $\vec{r}(2\hat{i} - 11\hat{j} - 10\hat{k}) - 6 = 0$

Is the point $(-2, -3, -1)$ closer to plane 1 or plane 2? Show your work.

14. Read the information given below and answer the questions that follow.

For an audition of a reality singing competition, interested candidates were asked to apply under one of the two musical genres - folk or classical and under one of the two age categories - below 18 or 18 and above.

The following information is known about the 2000 applications received:

- ◆ 960 of the total applications were for the folk genre.
- ◆ 192 of the folk applications were for the below 18 category.
- ◆ 104 of the classical applications were for the 18 and above category.

- a) What is the probability that an application selected at random is for the 18 and above category provided it is under the classical genre? Show your work.

[2 marks]

- b) An application selected at random is found to be under the below 18 category.

Find the probability that it is under the folk genre. Show your work.

[2 marks]

*****End of Paper*****