NAVYUG CONVENT SCHOOL

TERM-I EXAM (2021-2022)

[Time Allowed: 90 Minutes] CLASS - XII [Maximum Marks: 40

General Instructions:

- All questions are compulsory.
- Each question carries 1 mark.

Multiple Choice Questions

1. The tangent to the curve $y = e^{2x}$ at the point (0, 1) meets the x-axis at

   (a) (0, 1) (b) (2, 0) (c) $\left(-\frac{1}{2}, 0\right)$ (d) (–2, 0)

2. $\frac{d}{dx}(x^x)$ is equal to

   (a) x^{x-1} (b) $x \log x$ (c) $x^x(1 + \log x)$ (d) xx^{x-1}

3. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \frac{3\pi}{2}$, then the value of $x + y^2 + z^3$ is

   (a) 1 (b) 3 (c) 2 (d) 5

4. A function $f(x) = \frac{x}{x-5}$, is not a continuous function for x equals to

   (a) 5 (b) –5 (c) $R - \{5\}$ (d) 0

5. Given function $f(x) = x^2e^{-x}$, then 'f' increases in the interval

   (a) $(-\infty, \infty)$ (b) (–2, 0) (c) (2, ∞) (d) (0, 2)

6. If $x = at^2$, $y = 2at$, then $\frac{d^2y}{dx^2}$ is

   (a) $\frac{1}{t}$ (b) $-\frac{1}{t^2}$ (c) at^2 (d) $\frac{-1}{2at^3}$

7. Let Z be the set of integers and R be a relation defined in Z such that aRb if $(a - b)$ is divisible by 5. Then number of equivalence classes are

   (a) 2 (b) 3 (c) 4 (d) 5

8. Solution of *LPP*

To maximise $Z = 4x + 8y$

subject to constraints : $2x + y \leq 30$,

$x + 2y \leq 24, x \geq 3, y \leq 9, y \geq 0$ is

(*a*) $x = 12, y = 6$ (*b*) $x = 6, y = 12$ (*c*) $x = 9, y = 6$ (*d*) none of these

9. Given a square matrix A of order 3×3, such that $|A| = 12$, then the value of $|A.\ \text{adj}\ A|$ is

(*a*) 12 (*b*) 144 (*c*) 1728 (*d*) 72

10. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then $A^2 - 5A - 7I$ is

(*a*) a zero matrix (*b*) an identity matrix

(*c*) diagonal matrix (*d*) none of these

11. The function 'f' defined by

$$f(x) = \begin{cases} \dfrac{x^3 - 8}{x - 2}, & x \neq 2 \\ 12, & x = 2 \end{cases} \text{ is}$$

Which of the following is true?

(*a*) not continuous at $x = 2$ (*b*) continuous at $x = 2$

(*c*) not continuous at $x = 3$ (*d*) not continuous at $x = -2$

12. The matrix $\begin{bmatrix} 4 + 3k & 3 \\ 1 + 2k & 2 \end{bmatrix}$ is singular matrix, for k equal to

(*a*) 0 (*b*) -1 (*c*) 1 (*d*) no value of k

13. If A is a skew symmetric matrix then A^2 is a

(*a*) square matrix (*b*) diagonal matrix

(*c*) symmetric matrix (*d*) skew symmetric matrix

14. The function $f(x) = \dfrac{x + 1}{1 + \sqrt{1 + x}}$ is continuous at $x = 0$ if $f(0)$ is

(*a*) -1 (*b*) $\dfrac{1}{2}$ (*c*) 0 (*d*) 1

15. If $f(x) = \dfrac{x - 1}{|x - 1|}$, $x(\neq 1) \in R$ then range of 'f' is

(*a*) $\{-1, 1\}$ (*b*) $\{-1\}$ (*c*) R (*d*) 1

16. A function which is continuous at $x = 1$, but not differentiable at $x = 1$ is

(*a*) $|x|$ (*b*) $[x]$ (*c*) $sgn(x)$ (*d*) $|x - 1|$

17. The interval for which the function $f(x) = \cot^{-1}x + x$ increases is

(*a*) $(0, 1]$ (*b*) $[1, 2]$ (*c*) $(-\infty, \infty)$ (*d*) $[-\infty, 1]$

18. The function $f(x) = e^{|x|}$

(a) Continuous everywhere but not differentiable at $x = 0$

(b) Continuous and differentiable everywhere

(c) not continuous at $x = 0$

(d) none of these

19. Derivative of $\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a}$, with respect to x, is

(a) $\sin^{-1}\frac{x}{a}$ (b) $\frac{x}{2}\sqrt{a^2 - x^2}$ (c) $\sqrt{a^2 - x^2}$ (d) $\frac{1}{\sqrt{a^2 - x^2}}$

20. If $f(x) = 9^{x^2 + 2x}$, then $f'(-1)$ is

(a) 0 (b) 2 (c) 4 (d) -2

21.

Assertion-Reasoning Type MCQs

Direction: In the following questions (Q.21 to Q.24), a statement of Assertion (A) is followed by a statement of Reason (R). Read the given statements and choose the correct answer from the choices given below:

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

21. **Assertion (A):** Value of determinant $\begin{vmatrix} 2 & 0 & -3 \\ 1 & 4 & 6 \\ 1 & 2 & 1 \end{vmatrix}$ can be calculated using

$a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23}$, a_{ij} is element at ith row jth column and A_{ij} is cofactor of element a_{ij}.

Reason (R): Assertion is not correct as value of determinant is $a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13}$.

22. **Assertion (A):** For a given matrix A, $A.\text{adj}\, A = \begin{bmatrix} 14 & 0 \\ 0 & 14 \end{bmatrix}$ then $|A^{-1}|$ is $\frac{1}{14}$.

Reason (R): Assertion is correct as $A.\text{adj}\, A = |A|\, I$ hence $|A| = 14$ and $|A^{-1}| = \frac{1}{|A|} = \frac{1}{14}$.

23. **Assertion (A):** A relation R in the set of triangles T defined as $R = \{(T_1, T_2) : T_1, T_2 \in T, T_1 \sim T_2\}$ is an equivalence relation. According to given relation all right angled triangles are similar and belong to same equivalence class.

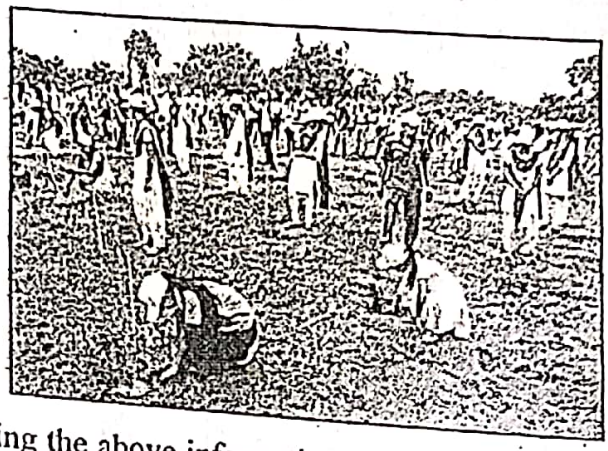
Reason (R): Assertion is false as we have to consider all types of triangles.

24. **Assertion (A):** To find second derivation of a function $y = f(x)$ we find $\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$.

Reason (R): Assertion not correct as $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$

Case-Based MCQs

I. Students of Grade 9, planned to plant saplings along straight lines, parallel to each other to one side of the playground ensuring that they had enough play area. Let us assume that they planted one of the rows of the saplings along the line $y = x - 4$. Let L be the set of all lines which are parallel on the ground and R be a relation on L.



Answer the following using the above information.

25. Let relation R be defined by $R = \{(L_1, L_2): L_1 \parallel L_2$ where $L_1, L_2 \in L\}$ then R is _____ relation.

(a) an equivalence
(b) only reflexive
(c) not reflexive
(d) symmetric but not transitive

26. Let $R = \{(L_1, L_2) : L_1 \perp L_2$ where $L_1, L_2 \in L\}$ which of the following is true?

(a) R is symmetric but neither reflexive nor transitive
(b) R is reflexive and transitive but not symmetric
(c) R is reflexive but neither symmetric nor transitive
(d) R is an equivalence relation

Or

27. The function $f: R \to R$ defined by $f(x) = x - 4$ is

(a) bijective
(b) surjective but not injective
(c) injective but not surjective
(d) neither surjective nor injective

28. Let $f: R \to R$ be defined by $f(x) = x - 4$. Then the range of $f(x)$ is _____

(a) R
(b) Z
(c) W
(d) Q

29. Let $R = \{(L_1, L_2) : L_1$ is parallel to L_2 and $L_1 : y = x - 4\}$ then which of the following can be taken as L_2 ?

(a) $2x - 2y + 5 = 0$
(b) $2x + y = 5$
(c) $2x + 2y + 7 = 0$
(d) $x + y = 7$

II. Amit, Biraj and Chirag were given the task of creating a square matrux of order 2. Below are the matrices created by them. A, B, C are the matrices created by Amit, Biraj and Chirag respectively.

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$$

If $a = 4$ and $b = -2$, based on the above information answer the following:

30. Sum of the matrices A, B and C, $A + (B + C)$ is

(a) $\begin{bmatrix} 1 & 6 \\ 2 & 7 \end{bmatrix}$ (b) $\begin{bmatrix} 6 & 1 \\ 7 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 7 & 2 \\ 1 & 6 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & 1 \\ 7 & 6 \end{bmatrix}$

31. $(A^T)^T$ is equal to

(a) $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix}$

32. $(bA)^T$ is equal to

(a) $\begin{bmatrix} -2 & -4 \\ 2 & -6 \end{bmatrix}$ (b) $\begin{bmatrix} -2 & 2 \\ -4 & -6 \end{bmatrix}$ (c) $\begin{bmatrix} -2 & 2 \\ -6 & -4 \end{bmatrix}$ (d) $\begin{bmatrix} -6 & -2 \\ 2 & 4 \end{bmatrix}$

33. $AC - BC$ is equal to

(a) $\begin{bmatrix} -4 & -6 \\ -4 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} -4 & -4 \\ 4 & -6 \end{bmatrix}$ (c) $\begin{bmatrix} -4 & -4 \\ -6 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} -6 & 4 \\ -4 & -4 \end{bmatrix}$

Or

34. $(a + b)B$ is equal to

(a) $\begin{bmatrix} 0 & 8 \\ 10 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 10 \\ 8 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 8 & 0 \\ 2 & 10 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & 0 \\ 8 & 10 \end{bmatrix}$

III. The shape of a toy is given as $f(x) = 6(2x^4 - x^2)$. To make the toy beautiful 2 sticks which are perpendicular to each other were placed at a point (2, 3), above the toy.

35. Which value from the following may be abscissa of critical point?

(a) $\pm \frac{1}{4}$ (b) $\pm \frac{1}{2}$ (c) ± 1 (d) None

36. Find the slope of the normal based on the position of the stick.

(a) 360 (b) −360 (c) $\frac{1}{360}$ (d) $\frac{-1}{360}$

37. What will be the equation of the tangent at the critical point if it passes through (2, 3)?

(a) $x + 360y = 1082$ (b) $y = 360x - 717$

(c) $x = 717y + 360$ (d) none

38. Find the second order derivative of the function at $x = 5$.

(a) 598 (b) 1176 (c) 3588 (d) 3312

Or

39. At which of the following intervals will $f(x)$ be increasing?

(a) $\left(-\infty, -\frac{1}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$ (b) $\left(-\frac{1}{2}, 0\right) \cup \left(\frac{1}{2}, \infty\right)$

(c) $\left(0, \frac{1}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$ (d) $\left(-\infty, -\frac{1}{2}\right) \cup \left(0, \frac{1}{2}\right)$

40. The Maximum value of $\left(\frac{1}{x}\right)^x$ is

a) e b) e^e c) $(e)^{\frac{1}{e}}$ d) $\left(\frac{1}{e}\right)^{\frac{1}{e}}$