Greenfields Public School

Dilshad Garden, GTB Enclave, Delhi-110093.
Tel; 22584740, 22118756. Email. Info @ greenfieldspublicschool.com

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COMPETENCY ASSIGNMENT

SUBJECT : Mathematics **GRADE : XII**

CHAPTER: 1 Relations and Functions **MONTH : April 2026**

(Section A)

Q1. A relation R defined on a set of human beings as

$\boldsymbol{R = \{(x, y): x \text{ is } 5 \text{ cm shorter than } y\} is}$:

a) reflexive only b) reflexive and transitive

c) symmetric and transitive d) neither transitive, nor symmetric nor reflexive.

Q2. A relation R in set $A = \{1,2,3\}$ is defined as $R = \{(1,1), (1,2), (2,2), (3,3)\}$. Which of the following ordered pair in R shall be removed to make it an equivalence relation on A?

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

Q3. Let set $X = \{1,2,3\}$, and a relation R is defined on X as $R = \{(1,3), (2,2), (3,2)\}$, then minimum ordered pairs which should be added in relation R to make it reflexive and symmetric are :

a) (1,1), (2,3), (1,2) b) (3,3), (3,1), (1,2)

c) (1,1), (3,3), (3,1), (2,3) d) (1,1), (3,3), (3,1), (1,2)

Q4. A function $f: R \to A$ defined as $f(x) = x^2 + 1$ is onto, if A is :

a) $(-\infty, \infty)$ b) $(1,\infty)$ c) $[1,\infty)$ d) $[-1,\infty)$

ASSERTION-REASON BASED QUESTIONS

A statement of Assertion (A) is followed by a statement of Reason (R).Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Assertion (A): For the relation $\boldsymbol{R = \{(1,1), (2,2), (3,3), (1,2), (2,3)\}}$ on set A={1,2,3} to be transitive, we must have (1,3) $\in \boldsymbol{R}$.

Reason (R): A relation R on a set A is transitive if

(a, b) $\in \boldsymbol{R}$ and $\boldsymbol{(b,c) \in R \Rightarrow (a,c) \in R \; \forall \; a,b,c \in A}$

Q6. Assertion (A) : A function $\boldsymbol{f: Z \to Z}$ defined as $\boldsymbol{f(x) = x^2 - 4}$ is injective.

Reason (R) : A function $f: A \to B$ is said to be injective if every element of A has distinct image in set B.

Q7. Let R be the relation on the set Z of integers given by $R = \{(a, b) : 2\ divides\ a - b\}$. Show that the relation R is transitive. Write the equivalence class [0].

Q8. A function $f: A \to B$ defined as $f(x) = 2x$ is both one-one and onto. If $A = \{1, 2, 3, 4\}$, then find the set B.

Q9. Let N be the set of natural numbers and R be the relation on $N \times N$ defined by (a, b) R (c, d) iff ad = bc for all a, b, c, d $\in N$. Show that R is an equivalence relation.

Q10. Show that the function $f: R - \{-1\} \to R - \{1\}$ given by $f(x) = \frac{x}{x+1}$ is bijective.

Q11. A relation R is defined on $N \times N$ (where N is the set of natural numbers) as : $(a, b)\ R\ (c, d) \Leftrightarrow a - c = b - d$. Show that R is an equivalence relation.

Q12. Let $f: W \longrightarrow W$ be defined as $f(n) = \begin{cases} n - 1, & if\ n\ is\ odd \\ n + 1, & if\ n\ is\ even \end{cases}$
Show that f is one-one and onto function.

Q13. Case Study: A person without family is not complete in this world because family is an integral part of all of us. Human beings are considered as the social animals living in group called as family. Family plays many important roles throughout the life.
Mr. D. N. Sharma is an honest person who is living happily with his family. He has a son Vidya and a daughter Madhulika. Mr. Vidya has two sons Tarun and Gajender and a daughter Suman while Mrs. Madhulika has two sons Shashank and Pradeep and two daughters Sweety and Anju. They all lived together and everyone shares equal responsibilities with the family, every member of the family emotionally attaches to each other in their happiness and sadness. They help each other in their bad times which give the feeling of security.
A family provides love, warmth and security to its all members throughout the life which makes it a complete family. A good and healthy family makes a good society and ultimately a good society involves in making a good country.
Based on the above information, answer the following questions :
Consider relation R on the set A of members of Mr. D. N. Sharma and his family at a particular time:

(i) If $= \{(x, y): x\ and\ y\ live\ in\ the\ same\ locality\}$, then show that R is reflexive relation.

(ii) If $R = \{(x, y): x\ is\ exactly\ 7\ cm\ taller\ than\ y\}$, then show that R is not a symmetric relation.

(iii) **If $= \{(x, y): x\ is\ wife\ of\ y\}$, then show that R is transitive.**

Ans 1. (d) Ans 2. (b) Ans 3. (c) Ans 4. (c) Ans 5. (a) Ans 6. (d)

Ans 7. $\{0, \pm 1, \pm 2, \pm 3, \ldots\}$ Ans 8. {2,4,6,8}

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COMPETENCY ASSIGNMENT

SUBJECT : Mathematics **GRADE : XII**

CHAPTER: 2 Inverse Trigonometric Functions **MONTH : April 2026**

(Section A)

Q1. The domain of the function $f(x) = \sin^{-1}(2x)$ is :

a) [0, 1] **b) [-1, 1]** **c) $[\frac{-1}{2}, \frac{1}{2}]$** **d) [-2,2]**

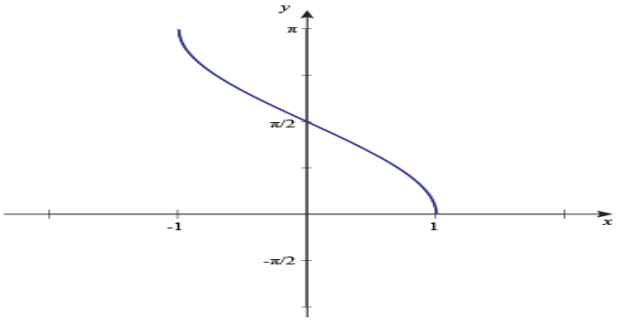
Q2. $\sin(\frac{\pi}{3} + \sin^{-1}\frac{1}{2})$ is equal to :

a) 1 **b) $\frac{1}{2}$** **c) $\frac{1}{3}$** **d) $\frac{1}{4}$**

Q3. If $\tan^{-1} x = y$, then

a) $-1 < y < 1$ **b) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$** **c) $\frac{-\pi}{2} < y < \frac{\pi}{2}$** **d) $y \in \{\frac{-\pi}{2}, \frac{\pi}{2}\}$**

Q4. Identify the function shown in the graph



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

ASSERTION-REASON BASED QUESTIONS

A statement of Assertion (A) is followed by a statement of Reason (R).Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Assertion (A) : Function $f: R \to R$ *given by* $f(x) = \sin x$ is not a bijection.

Reason (R) : A function $f: A \to B$ is said to be bijection if it is one-one and onto.

Q6. Assertion (A) : Domain of $y = \cos^{-1} x$ is [-1,1].

Reason (R) : The range of the principal value of branch of $y = \cos^{-1} x$ is $[0, \pi] - \{\frac{\pi}{2}\}$.

Q7. Find the value of k if $\sin^{-1}\left[k \tan\left(2\cos^{-1}\frac{\sqrt{3}}{2}\right)\right] = \frac{\pi}{3}$.

Q8. Find the value of $\sin^{-1}\left(\frac{-1}{2}\right) + \cos^{-1}\left(\frac{-\sqrt{3}}{2}\right) + \cot^{-1}\left(\tan\left(\frac{4\pi}{3}\right)\right)$.

Q9. Find the value of $\tan^{-1}\left[2\cos\left(2\sin^{-1}\frac{1}{2}\right)\right] + \tan^{-1} 1$.

Q10. Draw the graph of $\cos^{-1}(2x)$ in the domain $\left[\frac{-1}{2}, \frac{1}{2}\right]$.

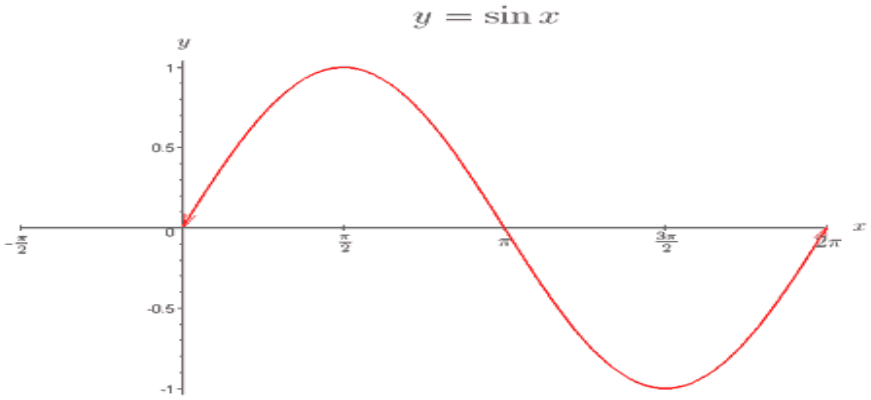
Q11. Prove that the simplest form of $\tan^{-1}\left(\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}\right), \pi < x < \frac{3\pi}{2}$, is $\frac{\pi}{4} - \frac{x}{2}$.

Q12. Find the value of each of the expressions :

(i) $\sin\left(\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{2}{3}\right)$.

(ii) $\tan\left(\sin^{-1}\frac{3}{5} + \cot^{-1}\frac{3}{2}\right)$.

Q13. **Case Study :** If a function $f : X \to Y$ defined as $f(x) = y$ is one-one and onto, then we can define a unique function $g: Y \to X$ such that $g(y) = x$, where $x \in X$ and $y = f(x), y \in Y$. Function g is called the universe of the function f. The domain of the sine function is R and function sin : R→ R is neither one-one nor onto. The following graph shows the sine function:



Let sine function is defined from set A to [-1, 1] such that inverse of sine function exists, i.e. $\sin^{-1} x$ is defined from [-1, 1] to A.

Based on the above information, answer the following questions .

(i) Write A as the principal value branch.

(ii) If $\sin^{-1} x$ is defined from [-1, 1] to its principal value branch, find the value of $\sin^{-1}\left(\frac{-1}{2}\right) - \sin^{-1} 1$.

(iii) (A) Draw the graph of $\sin^{-1} x$ from [-1, 1] to its principal value branch.

(B) Find the domain and range of $f(x) = 2\sin^{-1}(1 - x)$.

Answer Key:

Ans 1. (c) Ans 2. (a) Ans 3. (c) Ans 4. (a) Ans 5. (a) Ans 6. (c)

Ans 7. $(k = \frac{1}{2})$ Ans 8. $(\frac{5\pi}{6})$ Ans 9. $(\frac{\pi}{2})$ Ans 12. ((i) $\frac{17}{5\sqrt{13}}$ $(ii)\frac{17}{6}$)

Ans 13. (i) $[\frac{-\pi}{2}, \frac{\pi}{2}]$ (ii) $\frac{-2\pi}{3}$ (iii)(B) Domain=[0, 2], Range = $[-\pi, \pi]$

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COMPETENCY ASSIGNMENT

SUBJECT : Mathematics **GRADE : XII**

CHAPTER: 3 Matrices **MONTH : April 2026**

(Section A)

Q1. If a matrix has 36 elements, the number of possible orders it can have, is:

(a) 13 (b) 3 (c) 5 (d) 9

Q2. If $A = [a_{ij}]$ is an identity matrix, then which of the following is true?

a) $a_{ij} = \begin{cases} 0, & if\ i = j \\ 1. & if\ i \neq j \end{cases}$ b) $a_{ij} = 1\ \forall\ i, j$ c) $a_{ij} = 0\ \forall\ i, j$ d) $a_{ij} = \begin{cases} 0, & if\ i \neq j \\ 1. & if\ i = j \end{cases}$

Q3. Suppose $P\ and\ Q$ are two different matrices of order $3 \times n\ and\ n \times p$, then the order of the matrix $P \times Q$ is :

a) $3 \times p$ b) $p \times 3$ c) $n \times n$ d) 3×3

Q4. If $A = \begin{bmatrix} x & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 \\ -1 & 1 \end{bmatrix}$, then value of x for which $A^2 = B$ is :

a) -2 b) 2 c) 2 or -2 d) 4

ASSERTION-REASON BASED QUESTIONS

A statement of Assertion (A) is followed by a statement of Reason (R).Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Assertion (A) : For any symmetric matrix A, $B'AB$ is a skew-symmetric matrix.
Reason (R) : A square matrix P is skew-symmetric if $P' = -P$.

Q6. Assertion (A) : Every scalar matrix is a diagonal matrix.
Reason (R) : In a diagonal matrix, all the diagonal elements are 0.

Q7. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$, show that $(A - 2I)(A - 3I) = O$.

Q8. Show that the matrix A, where $A = \begin{bmatrix} 1 & -1 & 5 \\ -1 & 2 & 1 \\ 5 & 1 & 3 \end{bmatrix}$, is a symmetric matrix.

Q9. If $A = \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$, then verify that $(A - B)' = A' - B'$.

Q10. Express the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ -3 & 0 & 2 \\ 4 & 2 & -2 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

Q11. (i) If $\begin{bmatrix} a & c & 0 \\ b & d & 0 \\ 0 & 0 & 5 \end{bmatrix}$ is a scalar matrix, then find the value of $a + 2b + 3c + 4d$.

(ii) Find the integral value of x if $\begin{bmatrix} x & 4 & -1 \end{bmatrix} \begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & 0 \\ 2 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix} = O$.

Q12. Given matrix $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$, then show that $A^2 - 4A + 7I = O$.

Q13. If $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & -1 & -4 \end{bmatrix}$, verify that $(AB)' = B'A'$.

Q14. **Case Study : two farmers Shyam and Balwan Singh cultivate only three varieties of pulses namely Urad, Masoor and Mung. The sale (in Rs) of these varieties of pulses by both the farmers in the month of September and October is given by the following matrices A and B.**

September sales (in Rs)

$$A = \begin{array}{c} \begin{matrix} \textbf{Urad} & \textbf{Masoor} & \textbf{Mung} \end{matrix} \\ \begin{bmatrix} \mathbf{10000} & \mathbf{20000} & \mathbf{30000} \\ \mathbf{50000} & \mathbf{30000} & \mathbf{10000} \end{bmatrix} \end{array} \begin{matrix} \boldsymbol{Shyam} \\ \boldsymbol{Balwan\ Singh} \end{matrix}$$

October sales (in Rs)

$$B = \begin{array}{c} \begin{matrix} \textbf{Urad} & \textbf{Masoor} & \textbf{Mung} \end{matrix} \\ \begin{bmatrix} \mathbf{5000} & \mathbf{10000} & \mathbf{6000} \\ \mathbf{20000} & \mathbf{10000} & \mathbf{10000} \end{bmatrix} \end{array} \begin{matrix} \boldsymbol{Shyam} \\ \boldsymbol{Balwan\ Singh} \end{matrix}$$

Based on the above information, answer the following questions:

(i) Which variety of pulse has the highest selling value in the month of September for the farmer Balwan Singh?

(ii) Compute the profit for each farmer and for each variety sold in October, if both farmers receive 2% profit on gross sales.

(iii) Estimate the combined sales of Masoor in September and October for farmer Balwan Singh.

Or

(iii) Find the depreciation in sales of mung from September to October for farmer Shyam.

Answer Key :

Ans 1. (d) Ans 2. (d) Ans 3. (a) Ans 4. (a) Ans 5. (d) Ans 6. (c)

Ans 11. (i) 25 (ii) -4 Ans 14.(i) Urad dal (ii) Rs 420, Rs 800 (iii) Rs 40000 or (iii) Rs 24000

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COMPETENCY ASSIGNMENT

SUBJECT : Mathematics **GRADE : XII**

CHAPTER: 4 Determinants **MONTH : April 2026**

(Section A)

Q1. If $\begin{vmatrix} 2 & 3 & 2 \\ x & x & x \\ 4 & 9 & 1 \end{vmatrix} + 3 = 0$, then the value of x is :

a) 3 b) 0 c) -1 d) 1

Q2. Is the area of triangle is 8 sq. units with vertices (1, -3), (k, 2) and (6, 0). Then the value of k is/are:

(i) 4 (ii) 3 (iii) $\frac{42}{3}$ (iv) $\frac{44}{3}$

Choose the correct option from the following:

a) only (i) b) (ii) and (iv) c) (i) and (iii) d) (i) and (iv)

Q3. The cofactors of elements of the first column of the following matrix are :

$$\begin{vmatrix} 2 & 5 & -1 \\ -3 & 0 & 1 \\ 1 & 1 & -1 \end{vmatrix}$$

a) -1, 4, 5 b) -4, 5, -1 c) 4, 5, 1 d) -4, -5, 1

Q4. If a_{ij} and A_{ij} represent the $(ij)^{th}$ element and its cofactor of $\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$ respectively, then the value of $a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23}$ is :

a) 0 b) -28 c) 114 d) -114

ASSERTION-REASON BASED QUESTIONS

A statement of Assertion (A) is followed by a statement of Reason (R).Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q5. Assertion (A) : If $A = \begin{vmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{vmatrix}$, then $|3A| = 27|A|$

Reason (R) : If A is a square matrix of order n, then $|kA| = k^n|A|$.

Q6. Let $A = \begin{bmatrix} 25 & 1 & 6 \\ 23 & 7 & 4 \\ 11 & 3 & 2 \end{bmatrix}$ be a 3×3 matrix.

Assertion (A) : A^{-1} does not exist.

Reason(R) : A is a singular matrix.

Q7. Consider the matrix $X = \begin{bmatrix} p & -2 & -3 \\ -2 & 2 & 6 \\ 1 & 3 & q \end{bmatrix}$, where $p, q \in R$. The cofactor of element 6 is -11 and the minor of element 2 is 0. Find the value of $p \; and \; q$.

Q8. Find $adj.A, \; if \; A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$.

Q9. Find the value of $x \; for \; which \; (x, 4), (2,2) and \; (10, x)$ are collinear.

Q10. Find $(AB)^{-1}$ if $A = \begin{bmatrix} 1 & 0 \\ -4 & 2 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$.

Q 11. If $= \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then show that $A^2 - 4A - 5I = 0$, and hence find A^{-1}.

Q 12. Find the product of the matrices $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix} \begin{bmatrix} -6 & 17 & 13 \\ 14 & 5 & -8 \\ -15 & 9 & -1 \end{bmatrix}$ and hence solve the system of linear equations:

$x + 2y - 3z = -4$

$2x + 3y + 2z = 2$

$3x - 3y - 4z = 11$

Q13. **Case Study**: A school plans to award its students for the values of honesty, regularity and hard work, with a total cash award of ₹6,000. Three times the award money for hard work, when added to the amount given for honesty, total ₹11,000. Additionally, the combined award money for honesty and hard work is double the amount allocated for regularity.

On the basis of the above information, answer the following questions:

(i) If ₹ x is awarded to honesty, ₹ y to regularity and ₹ z is awarded to hard work, then what is the matrix equation representing the above situation in the form $AX = B$?

(ii) What is the value of $|adj \; A|$?

(iii) What is the value of $|A^{-1}|$?

Or

Write the matrix $A(adj \; A)$.

Ans 1. (c) Ans 2. (d) Ans 3. (a) Ans 4. (a) Ans 5. (a) Ans 6. (a)

Ans 7. p = 3, q = -1 Ans 8. $\begin{bmatrix} 3 & 1 \\ -4 & 2 \end{bmatrix}$ Ans 9. -2, 6 Ans 10. $\begin{bmatrix} 5 & \frac{1}{2} \\ 9 & 1 \end{bmatrix}$

Ans 11. $A^{-1} = \frac{1}{5}\begin{bmatrix} -3 & 2 & 2 \\ 2 & -3 & 2 \\ 2 & 2 & -3 \end{bmatrix}$ Ans 12. $x = 3,\ y = -2,\ z = 1$

Ans 13. (i) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 3 \\ 1 & -2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6000 \\ 11000 \\ 0 \end{bmatrix}$

(ii) 36 (iii) $\frac{1}{6}$ or $\begin{bmatrix} 6 & 0 & 0 \\ 0 & 6 & 0 \\ 0 & 0 & 6 \end{bmatrix}$

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COMPETENCY ASSIGNMENT

SUBJECT : Mathematics **GRADE : XII**

CHAPTER: 5 Continuity and Differentiability **MONTH : April 2026**

(Section A)

Q1. For what values of k may the function $f(x) = \begin{cases} k(3x^2 - 5x), & x \leq 0 \\ \cos x, & x > 0 \end{cases}$ become continuous.

a) 0 b) 1 c) $\frac{-1}{2}$ d) no value

Q2. The function $f(x) = [x]$, where $[x]$ denotes the greatest integer less than or equal to x, is continuous at :

a) $x = 1$ b) $x = 1.5$ c) $x = -2$ d) $x = 4$

Q3. The derivative of $\sin(x^2)$ with respect to x, at $x = \sqrt{\pi}$ is:

a) 1 b) -1 c) $-2\sqrt{\pi}$ d) $2\sqrt{\pi}$

Q4. The number of points, where $f(x) = [x], 0 < x < 4$ ($[.]$ denotes greatest integer function) is not differentiable is:

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

Q5. Let $y = f\left(\frac{1}{x}\right)$ and $f'(x) = x^3$. What is the value of $\frac{dy}{dx}$ at $x = \frac{1}{2}$?

a) $\frac{-1}{64}$ b) $\frac{-1}{32}$ c) -32 d) -64

ASSERTION-REASON BASED QUESTIONS

A statement of Assertion (A) is followed by a statement of Reason (R).Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q6. Assertion (A) : The derivative of 2^x with respect to 3^x is $(\frac{2}{3})^x \frac{\log 2}{\log 3}$.

Reason (R) : If $u = f(x)$ and $v = g(x)$ are two differentiable functions of x, then to find the

derivative of $f(x)$ with respect to $g(x)$, $\frac{du}{dv} = \frac{\frac{du}{dx}}{\frac{dv}{dx}}$.

Q7. Assertion (A) : The function $\sqrt{x-5}$ is continuous in $(5, \infty)$.

Reason (R) : The function $\sqrt{x-5}$ is differentiable in $(5, \infty)$.

Q8. Show that the function $f(x) = |x|^3$ is differentiable at all points of its domain. (2)

Q9. If $y = cos^3(sec^2 2t)$, find $\frac{dy}{dt}$. (2)

Q10. If $y = 2\sqrt{\sec(e^{2x})}$, then find $\frac{dy}{dx}$. (2)

Q11. If $y = \sin^{-1}(\frac{\sqrt{1+x}+\sqrt{1-x}}{2})$, then show that $\frac{dy}{dx} = \frac{-1}{2\sqrt{1-x^2}}$. (3)

Q12. Find the values of a and b so that the function f defined as: (3)

$$f(x) = \begin{cases} \frac{x-2}{|x-2|} + a, & if\ x < 2 \\ a + b, & if\ x = 2 \\ \frac{x-2}{|x-2|} + b, & if\ x > 2 \end{cases}$$

is a continuous function.

Q13. If $(x^2 + y^2)^2 = xy$, then find $\frac{dy}{dx}$. (3)

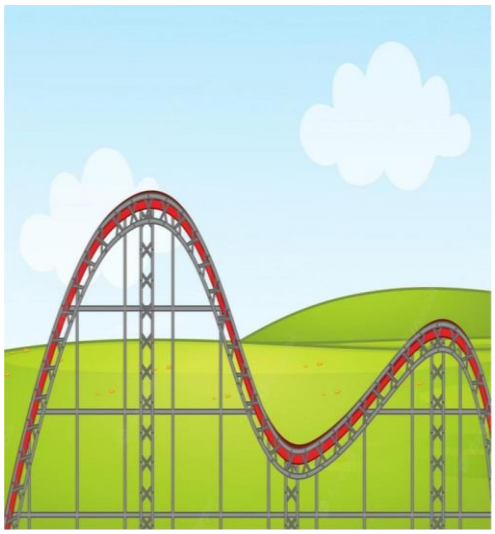
Q14. If $y^x . x^y = 1$, find $\frac{dy}{dx}$. (5)

Q15. If $(\sin x)^y = x + y$, then show that $\frac{dy}{dx} = \frac{1-(x+y)y \cot x}{(x+y)\log \sin x - 1}$. (5)

Q16. If $y = \sec x + \tan x$, then prove that $\frac{d^2y}{dx^2} = \frac{\cos x}{(1-\sin x)^2}$. (5)

Q17. Case Study: The equation of the path traced by a roller-coaster is given by the polynomial

$f(x) = a(x + 9)(x + 1)(x - 3)$. The roller-coaster crosses y-axis at a point$(0, -1)$.



Based on the given information, answer the following questions: (4)

(i) Find the value of 'a'.

(ii) Find $f'''(x) at\ x = 1$.

Answer Key:

Ans1. (d)

Ans2. (b)

Ans3. (c)

Ans4. (c)

Ans5. (c)

Ans6. (a)

Ans7. (a)

Ans9. $-12\ sec^2 2t . \tan 2t\ . cos^2(sec^2 2t) . \sin(sec^2 2t)$

Ans10. $2e^{2x}\sqrt{\sec(e^{2x})}.\tan(e^{2x})$

Ans12. a=1, b= -1

Ans13. $\frac{y-4x(x^2+y^2)}{4y(x^2+y^2)-x}$

Ans14. $-\frac{y(y+x\log y)}{x(x+y\log x)}$

Ans17. (i) $a = \frac{1}{27}$ (ii) $\frac{20}{27}$