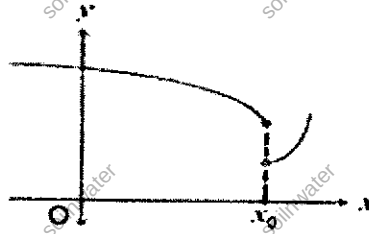


DO ALL THE QUESTIONS, ALL WORKING, INCLUDING ROUGH WORK, SHOULD BE DONE ON THE SAME SHEET AS, AND ADJACENT TO THE REST OF THE ANSWER? THE INTENDED MARKS FOR QUESTIONS OR PARTS OF QUESTIONS ARE GIVEN IN BRACKETS [].

Question 1. Given below are the graphs of $f(x)$ along with the statements. Which one of the following statements is NOT correct about the graphs?

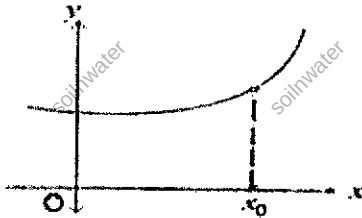
[1]

(a)



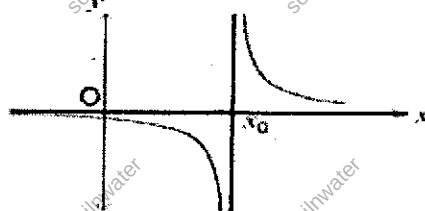
$$\lim_{x \rightarrow x_0^+} f(x) \neq \lim_{x \rightarrow x_0^-} f(x)$$

(b)



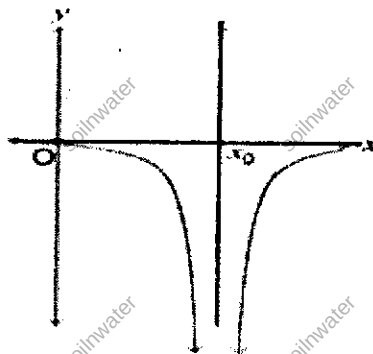
$f(x)$ is not defined at $x = x_0$

(c)



$f(x)$ is not continuous at $x = x_0$

(d)



$f(x)$ is continuous at $x = x_0$

Question 2. Matrix P is a singular matrix of order 3×3 .

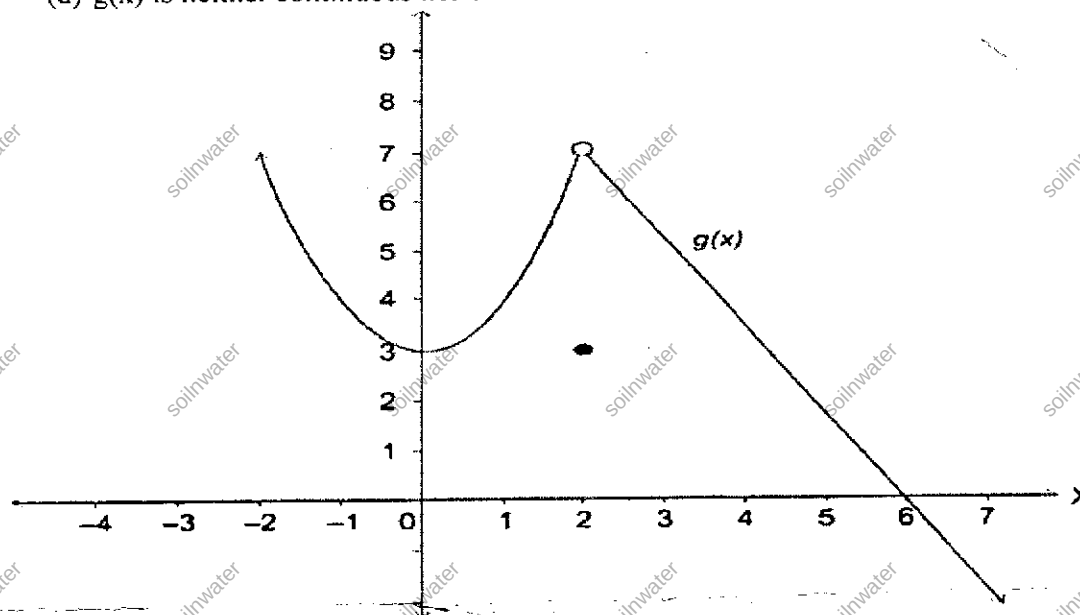
Assertion: The inverse of matrix P does not exist.

Reason : The determinant of matrix P is zero.

- (a) Both Assertion and Reason are true and Reason is the correct explanation for Assertion.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation for Assertion.
- (c) Assertion is true and Reason is false.
- (d) Assertion is false and Reason is true.

Question 3. Shown below is the graph of a function, $g(x)$. Which of the following is true?

- (a) $g(x)$ is continuous and differentiable at $x = 2$
- (b) $g(x)$ is continuous but not differentiable at $x = 2$
- (c) $g(x)$ is not continuous but differentiable at $x = 2$
- (d) $g(x)$ is neither continuous nor differentiable at $x = 2$



Question 4. Statement 1: The function $f: N \rightarrow N$ given by $f(x) = 4x$ is one to one and onto.

Statement 2: The function $f: R \rightarrow R$ given by $f(x) = 6x$ is one to one and onto.

Which one of the following options is correct?

- (a) Both the statements are true.
- (b) Both the statements are false.
- (c) Statement 1 is true and Statement 2 is false.
- (d) Statement 1 is false and Statement 2 is true

Question 5. Check whether the relation S in the set R of real numbers, defined as:

$S = \{ (a, b) : 1 + ab > 0 ; a, b \in \text{set of real numbers} \}$ is reflexive, symmetric, transitive.

OR

Let N denote natural numbers and R be a relation on $N \times N$ defined by $(a, b) R (c, d)$ if $ad = bc$. Show that R is an equivalence relation.

Question 6. If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$, then find a scalar 'k', so that $A^2 = 3A + kI$. Hence find A^{-1} .

Question 7. Express the matrix $A = \begin{bmatrix} 2 & -4 & 0 \\ -8 & -6 & 6 \\ 8 & 4 & -2 \end{bmatrix}$ as the sum of a symmetric and

skew-symmetric matrix.

Question 8. By using the properties of determinants prove the following: -

$$\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$$

Question 9. Prove that the function $f: [0, \infty) \rightarrow R$ given by $f(x) = 9x^2 + 6x - 5$ is not invertible. Modify the codomain of the function f to make it invertible and hence find f^{-1} [4]

Question 10. Solve the equation; $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2} \tan^{-1}x$ [4]

OR

Solve the equation; $\sin^{-1}\left(\frac{4x}{5}\right) + \sin^{-1}\left(\frac{3x}{5}\right) = \sin^{-1}x$

Question 11. If $\cos^{-1}\frac{x}{2} + \cos^{-1}\frac{y}{3} = \alpha$, then prove that; $9x^2 - 12xy \cos \alpha + 4y^2 = 36 \sin^2 \alpha$. [4]

Question 12. Discuss the differentiability for the function at $x = 2$ [4]

$$f(x) \begin{cases} 6x^2 + 3 & \text{when } x \geq 2 \\ 24x - 21 & \text{when } x < 2 \end{cases}$$

Question 13. (a) If $f(x) = \sqrt{\tan \sqrt{x}}$, then find $f'\left(\frac{\pi^2}{16}\right)$. Show proper working. [6]

(b) If $f(x) = \log \sqrt{\frac{1+\cos x}{1-\cos x}}$ then prove that $f'(x) = -\operatorname{cosec} x$. show proper working.

[6]

Question 14. The sum of three numbers is 6. If we multiply the 3rd number by 3 and 2nd number to it we get 11. By adding the first and third numbers, we get double of the second number. Represent it algebraically and find the number using matrix method. add