

FUNCTIONS

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1. The interval in which the function f given by $f(x) = x^2 e^{-x}$ is strictly increasing, is
 - (a) $(-\infty, \infty)$
 - (b) $(-\infty, 0)$
 - (c) $(2, \infty)$
 - (d) $(0, 2)$
2. The function $f(x) = \frac{x-1}{x(x^2-1)}$ is discontinuous at
 - (a) exactly one point
 - (b) exactly two points
 - (c) exactly three points
 - (d) no points
3. The function $f : \mathbb{R} \rightarrow [-1, 1]$ defined by $f(x) = \cos x$ is
 - (a) both one-one and onto
 - (b) not one-one, but onto
 - (c) one-one, but onto
 - (d) neither one-one, nor onto
4. The range of the principal value branch of the function $y = \sec^{-1} x$ is
5. The principal value of $\cos^{-1}\left(\frac{-1}{2}\right)$ is

6. Find the value of k , so that the function $f(x) = \begin{cases} kx^2 + 5 & \text{if } x \leq 1, \\ 2 & \text{if } x > 1 \end{cases}$ is continuous at $x = 1$.

7. Check whether the relation \mathbb{R} in the set \mathbb{N} of natural numbers given by

$$\mathbb{R} = \{(a, b) : a \text{ is divisor of } b\} \quad (1)$$

is reflexive, symmetric or transitive. Also determine whether \mathbb{R} is an equivalence relation.

8. Prove that:

$$\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{2}{9} = \frac{1}{2} \sin^{-1} \left(\frac{4}{5} \right) \quad (2)$$