

Topics : Continuity & Derivability, Function, Limits, Quadratic Equation, Trigonometric Ratio

Type of Questions	M.M., Min.
Single choice Objective (no negative marking) Q.1,2	(3 marks, 3 min.) [6, 6]
Multiple choice objective (no negative marking) Q.3	(5 marks, 4 min.) [5, 4]
Subjective Questions (no negative marking) Q.4,5,6,7,8	(4 marks, 5 min.) [20, 25]

- If $f(x) = \frac{a \cos x - \cos bx}{x^2}$, $x \neq 0$ and $f(0) = 4$ is continuous at $x = 0$, then the ordered pair (a, b) is

(A) $(\pm 1, 3)$ (B) $(1, \pm 3)$ (C) $(-1, -3)$ (D) $(-1, 3)$
- Let $A = \{9, 10, 11, 12, 13\}$ and $f : A \rightarrow N$ be a function defined as $f(x) =$ Highest prime factor of x . Then number of elements in the range of $f(x)$ is :-

(A) 5 (B) 4 (C) 3 (D) None of these
- Which of the statements(s) is/are INCORRECT ?

(A) If $f + g$ is continuous at $x = a$, then f and g are continuous at $x = a$.

(B) If $\lim_{x \rightarrow a} (f g)$ exists, then $\lim_{x \rightarrow a} f$ and $\lim_{x \rightarrow a} g$ both exists.

(C) Discontinuity at $x = a \Rightarrow$ non existences of limit

(D) All functions defined on a closed interval attain maximum or a minimum value in its interval.
- Evaluate

(i) $\lim_{x \rightarrow 0} \frac{\cos(xe^x) - \cos(xe^{-x})}{x^3}$ (ii) $\lim_{x \rightarrow 0} (\cos ax)^{\cos ec^2 bx}$
- Evaluate :

(i) $\lim_{x \rightarrow 2a^+} \frac{\sqrt{x-2a} + \sqrt{x} - \sqrt{2a}}{\sqrt{x^2 - 4a^2}}$ (ii) $\lim_{x \rightarrow 0^+} \left(\frac{e^{x \ln(2^x - 1)} - (2^x - 1)^x \sin x}{e^{x \ln x}} \right)^{1/x}$
- Find the sum of an infinite geometric progression whose first term is the limiting value of the function

$$f(x) = \frac{\sin\left(x - \frac{\pi}{6}\right)}{\sqrt{3} - 2\cos x} \text{ at } x = \frac{\pi}{6} \text{ and whose common ratio is the limiting value of the function}$$

$$g(x) = \frac{\sin(x)^{1/3} \ln(1+3x)}{(\arctan \sqrt{x})^2 (e^{5 \cdot x^{1/3}} - 1)} \text{ as } x \rightarrow 0^+$$
- Find the exact value of the expression $\frac{\tan 70^\circ - \tan 20^\circ - 2 \tan 40^\circ}{\tan 10^\circ}$.
- Find all values of a for which the inequality $(a - 3)x^2 - 2ax + 3a - 6 > 0$ is satisfied for all values of x .

Answers Key

1. (B) 2. (B) 3. (A)(B)(C)(D)

4. (i) -2 (ii) $e^{-\frac{a^2}{2b^2}}$

5. (i) $\frac{1}{2\sqrt{a}}$ (ii) $\frac{1}{e} \ln 2$ 6. $a = 1, r = \frac{3}{5}, S_{\infty} = \frac{5}{2}$

7. 4 8. $a \in (6, \infty)$

