

CH-10

Function

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I. C: MCQs WITH ONE CORRECT ANSWER

20. Suppose $f(x) = f(x+1)^2$ for $x \geq -1$. If $g(x)$ is the function whose graph is the reflection of the graph $f(x)$ with respect to the line $y=x$, then $g(x)$ equal (2002S)

- 1) $-\sqrt{x}-1, x \geq 0$
- 2) $\frac{1}{(x+1)^2}, x > -1$
- 3) $\sqrt{x+1}, x \geq -1$
- 4) $\sqrt{x}-1, x \geq 0$

21. Let function $f : R \rightarrow R$ be defined by $f(x) = 2x + \sin x$ for $x \in R$, then f is (2003S)

- 1) one-to-one and onto
- 2) one-to-one but not onto
- 3) onto but not one-to-one
- 4) neither one-to-one nor onto

22. If $f : [0, \infty) \rightarrow [0, \infty)$, and $f(x) = \frac{x}{1+x}$ then f is (2003S)

- 1) one-one and onto
- 2) one-one but not onto
- 3) onto but not one-one
- 4) neither one-one nor onto

23. Domain of definition of the functions

$f(x) = \sqrt{\sin^{-1}(2x) + \frac{\pi}{6}}$ for real valued x , is (2003S)

- 1) $\left[-\frac{1}{4}, \frac{1}{2}\right]$
- 2) $\left[-\frac{1}{2}, \frac{1}{2}\right]$
- 3) $\left(-\frac{1}{2}, \frac{1}{9}\right)$
- 4) $\left[-\frac{1}{4}, \frac{1}{4}\right]$

24. Range of the function $f(x) = \frac{x^2+x+2}{x^2+x+1}, x \in R$ is (2003S)

- 1) $(1, \infty)$
- 2) $(1, \frac{11}{7}]$

3) $(1, \frac{7}{3}]$

4) $(1, \frac{7}{5}]$

25. If $f(x) = x^2 + 2bx + 2c^2$ and $g(x) = -x^2 - 2cx + b^2$ such that $\min f(x) > \max g(x)$, then the relations between b and c , is (2003S)

- 1) no real value of b & c
- 2) $0 < c < b\sqrt{2}$
- 3) $|c| < |b|\sqrt{2}$
- 4) $|c| > |b|\sqrt{2}$

26. If the function $f(x) = \sin x + \cos x, g(x) = x^2 - 1$, then $g(f(x))$ is invertible in the domain (2004S)

- 1) $\left[0, \frac{\pi}{2}\right]$
- 2) $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$
- 3) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

4) $[0, \pi]$

27. If the function $f(x)$ and $g(x)$ are defined on $R \rightarrow R$ such that (2005S)

$$f(x) = \begin{cases} 0, & x \in \text{rational} \\ x, & x \in \text{irrational} \end{cases}$$

$$g(x) = \begin{cases} 0, & x \in \text{rational} \\ x, & x \in \text{irrational} \end{cases} \quad \text{then } (f-g)(x) \text{ is}$$

- 1) one-one & onto
- 2) neither one-one nor onto
- 3) one-one but not onto
- 4) onto but not one-one

28. X and Y are two sets and $f : X \rightarrow Y$. If $\{f(c) = y; c \in X, y \in Y\}$ and $\{f^{-1}(d) = X; d \in Y, x \in X\}$, then the true statement is (2005S)

- 1) $f(f^{-1}(b)) = b$
- 2) $f^{-1}(f(a)) = a$
- 3) $f(f^{-1}(b)) = b, b \subset y$
- 4) $f^{-1}(f(a)) = a, a \subset x$

29. If $F(x) = \left(f\left(\frac{x}{2}\right)\right)^2 + \left(g\left(\frac{x}{2}\right)\right)^2$ where $f''(x) = -f(x)$ and $g(x) = f'(x)$ and given that $F(5) = 5$, then $F(10)$ is equal to (2006,-3M,-1)

- 1) 5
- 2) 10
- 3) 0
- 4) 15

30. Let $f(x) = \frac{x}{(1+x^n)^{\frac{1}{n}}}$ for $n \geq 2$ and $g(x) = \underbrace{(f \circ f \circ \dots \circ f)(x)}_{f \text{ occurs } n \text{ times}}$. Then $\int x^{n-2} g(x) dx$ equals. (2007-3 marks)

- 1) $\frac{1}{n(n-1)}(1 + nx^n)^{1-\frac{1}{n}}$
- 2) $\frac{1}{n-1}(1 + nx^n)^{1-\frac{1}{n}}$
- 3) $\frac{1}{n+1}(1 + nx^n)^{1+\frac{1}{n}}$
- 4) $\frac{1}{n+1}(1 + nx^n)^{1+\frac{1}{n}}$

31. Let f, g and h be real-valued functions defined on the interval $[0, 1]$ by $f(x) = e^{x^2} + e^{-x^2}$, $g(x) = xe^{x^2} + e^{-x^2}$ and $h(x) = x^2e^{-x^2}$. If a, b and c denote, respectively, the absolute maximum of f, g and h on $[0, 1]$, then (2010)

- 1) $a = b$ and $b \neq c$
- 2) $a = c$ and $a \neq b$
- 3) $a \neq b$ and $c \neq b$
- 4) $a = b = c$

32. Let $f(x) = x^2$ and $g(x) = \sin x$ for all $x \in R$. Then the set of all x satisfying $(f \circ g \circ g \circ f)(x) = (g \circ g \circ f)(x)$, where $(f \circ g)(x) = f(g(x))$, is (2011)

- 1) $\pm \sqrt{n\pi}, n \in \{0, 1, 2, \dots\}$
- 2) $\pm \sqrt{n\pi}, n \in \{1, 2, \dots\}$
- 3) $\frac{\pi}{2} + 2n\pi, n \in \{\dots - 2, -1, 0, 1, 2, \dots\}$
- 4) $2n\pi, n \in \{\dots - 2, -1, 0, 1, 2, \dots\}$

33. The function $f : [0, 3] \rightarrow [1, 29]$, defined by $f(x) = 2x^3 - 15x^2 + 39x + 1$, is (2012)

- 1) one-one and onto
- 2) onto but not one-one
- 3) one-one but not onto
- 4) neither one-one nor onto

II. D: MCQs with ONE OR MORE THAN ONE CORRECT

1. If $y = f(x) = \frac{x+2}{x-1}$ then (2008S)

- 1) $x = f(y)$
- 2) $f(1) = 3$
- 3) y increase with x for $x < 1$
- 4) f is a rational function on x