CH-10
Function

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I. C: MCQs with One correct Answer

1) Suppose $f(x) = f(x+1)^2$ for x ≥ -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)

   a) $-\sqrt{x} - 1$,x≥0
   b) $\frac{1}{(x+1)^2}, x > -1$
   c) $\sqrt{x+1}$,$x \geq -1$
   d) $\sqrt{x} - 1, x \geq 0$

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

   a) one-to-one and onto
   b) one-to-one but not onto
   c) onto but not not onto
   d) neither one-to-one nor onto

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

   a) one-one and onto
   b) one-one but not onto
   c) onto but not one-one
   d) neither one-one nor onto

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

   a) $\left[-\frac{1}{4}, \frac{1}{2}\right]$
   b) $\left[-\frac{1}{2}, \frac{1}{2}\right]$
   c) $\left(-\frac{1}{2}, \frac{1}{9}\right)$
   d) $\left[-\frac{1}{4}, \frac{1}{4}\right]$

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

   a) $(1, \infty)$
   b) $(1, \frac{11}{7}]$
   c) $(1, \frac{7}{3}]$
   d) $(1, \frac{7}{5}]$

6) 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)

   a) no real value of $b\&c$
   b) $0 < c < b\sqrt{2}$
   c) $|c| < |b|\sqrt{2}$
   d) $|c| > |b|\sqrt{2}$

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

   a) $\left[0, \frac{\pi}{2}\right]$
   b) $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$
   c) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
   d) $[0, \pi]$

8) If the function $f(x)$ and $g(x)$ are defined on $R \to R$ such that (2005S)

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

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

   a) one-one & onto
   b) neither one-one nor onto
   c) one-one but not onto
   d) onto but not one-one

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

   a) $f(f^{-1}(b)) = b$

b) $f^{-1}(f(a)) = a$
c) $f(f^{-1}(b)) = b, b \subset y$
d) $f^{-1}(f(a)) = a, a \subset x$

10) 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)
a) 5
b) 10
c) 0
d) 15

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

a) $\frac{1}{n(n-1)}(1+nx^n)^{1-\frac{1}{n}}$
b) $\frac{1}{n-1}(1+nx^n)^{1-\frac{1}{n}}$
c) $\frac{1}{n+1}(1+nx^n)^{1+\frac{1}{n}}$
d) $\frac{1}{n+1}(1+nx^n)^{1+\frac{1}{n}}$

12) 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 $h(x) = x^2 e^{-x^2}$ .If a, b and c denote,respectively,the absolute maximum of f, g and h on [0,1],then (2010)
a) $a = b$ and $b \neq c$
b) $a = c$ and $a \neq b$
c) $a \neq b$ and $c \neq b$
d) $a = b = c$

13) 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)
a) $\pm\sqrt{n\pi}, n \in \{0, 1, 2....\}$
b) $\pm\sqrt{n\pi}, n \in \{1, 2, ...\}$
c) $\frac{\pi}{2} + 2n\pi, n \in \{... - 2, -1, 0, 1, 2...\}$
d) $2n\pi, n \in \{... - 2, -1, 0, 1, 2...\}$

14) The function $f : [0,3] \to [1,29]$, defined by $f(x) = 2x^3 - 15x^2 + 39x + 1$,is (2012)
a) one-one and onto
b) onto but not one-one
c) one-one but not onto
d) 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)
a) $x = f(y)$
b) $f(1) = 3$
c) y increase with x for $x < 1$
d) f is a rational function on x