

(1) Let $R = \{ (3, 3) (6, 6) (9, 9) (12, 12), (6, 12) (3, 9) (3, 12), (3, 6) \}$ be a relation on the set $A = \{3, 6, 9, 12\}$. The relation is

- (a) reflexive and transitive (b) reflexive only
(c) an equivalence relation (d) reflexive and symmetric only [AIEEE 2005]

(2) Let $f: (-1, 1) \rightarrow B$ be a function defined by $f(x) = \tan^{-1} \frac{2x}{1-x^2}$, then f is both one-one and onto when B is the interval

- (a) $\left(0, \frac{\pi}{2}\right)$ (b) $\left[0, \frac{\pi}{2}\right]$ (c) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (d) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ [AIEEE 2005]

(3) If a real valued function $f(x)$ satisfies the functional equation $f(x - y) = f(x)f(y) - f(a - x)f(a + y)$, where 'a' is a given constant and $f(0) = 1$, then $f(2a - x)$ is equal to

- (a) $-f(x)$ (b) $f(x)$ (c) $f(a) + f(a - x)$ (d) $f(-x)$ [AIEEE 2005]

(4) Let $R = \{ (1, 3), (4, 2), (2, 4), (2, 3), (3, 1) \}$ be a relation on the set $A = \{1, 2, 3, 4\}$. The relation R is

- (a) a function (b) transitive (c) not symmetric (d) reflexive [AIEEE 2004]

(5) The range of the function $f(x) = {}^{7-x}P_{x-3}$ is

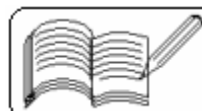
- (a) $\{1, 2, 3\}$ (b) $\{1, 2, 3, 4, 5, 6\}$
(c) $\{1, 2, 3, 4\}$ (d) $\{1, 2, 3, 4, 5\}$ [AIEEE 2004]

(6) If $f: R \rightarrow S$, defined by $f(x) = \sin x - \sqrt{3} \cos x + 1$ is onto, then the interval of S is

- (a) $[0, 3]$ (b) $[-1, 1]$ (c) $[0, 1]$ (d) $[-1, 3]$ [AIEEE 2004]

(7) The graph of the function $f(x)$ is symmetrical about the line $x = 2$, then

- (a) $f(x + 2) = f(x - 2)$ (b) $f(2 + x) = f(2 - x)$
(c) $f(x) = f(-x)$ (d) $f(x) = -f(-x)$ [AIEEE 2004]



(8) The domain of the function $f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$ is

- (a) [2, 3] (b) [2, 3] (c) [1, 2] (d) [1, 2] [AIEEE 2004]

(9) If $f: \{1, 2, 3, \dots\} \rightarrow \{0, \pm 1, \pm 2, \dots\}$ is defined by

$$f(x) = \begin{cases} \frac{x}{2}, & \text{if } x \text{ is even} \\ -\frac{(x-1)}{2}, & \text{if } x \text{ is odd} \end{cases} \quad \text{then value of } f^{-1}(-100) \text{ is}$$

- (a) 100 (b) 199 (c) 200 (d) 201 [AIEEE 2003]

(10) Domain of definition of the function $f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x)$ is

- (a) (1, 2) (b) (-1, 0) \cup (1, 2)
(c) (1, 2) \cup (2, ∞) (d) (-1, 0) \cup (1, 2) \cup (2, ∞) [AIEEE 2003]

(11) The function $f(x) = \log(x + \sqrt{x^2 + 1})$ is a/an

- (a) even function (b) odd function
(c) periodic function (d) none of these [AIEEE 2003]

(12) The function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \sin x$ is

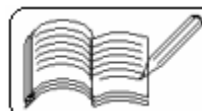
- (a) into (b) onto (c) one-one (d) many-one [AIEEE 2002]

(13) The range of the function $f(x) = \frac{2+x}{2-x}$, $x \neq 2$ is

- (a) \mathbb{R} (b) $\mathbb{R} - \{-1\}$ (c) $\mathbb{R} - \{1\}$ (d) $\mathbb{R} - \{2\}$ [AIEEE 2002]

(14) If $f(x) = \begin{cases} x, & x \in \mathbb{Q} \\ 0, & x \notin \mathbb{Q} \end{cases}$ and $g(x) = \begin{cases} 0, & x \in \mathbb{Q} \\ x, & x \notin \mathbb{Q} \end{cases}$, then $(f - g)$ is

- (a) one-one, onto (b) neither one-one nor onto
(c) one-one but not onto (d) onto but not one-one [IIT 2005]



(15) If $f(x) = \sin x + \cos x$ and $g(x) = x^2 - 1$, then $g[f(x)]$ will be invertible for the domain

- (a) $[0, \pi]$ (b) $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$ (c) $\left[0, \frac{\pi}{2}\right]$ (d) $\left[-\frac{\pi}{2}, 0\right]$ [IIT 2004]

(16) The range of the function $f(x) = \frac{x^2 + x + 2}{x^2 + x + 1}$, $x \in (-\infty, \infty)$ is

- (a) $[1, \infty)$ (b) $(1, \frac{11}{7})$ (c) $(1, \frac{7}{3}]$ (d) $[1, \frac{7}{5}]$ [IIT 2003]

(17) $f: [0, \infty) \rightarrow [0, \infty)$, $f(x) = \frac{x}{1+x}$ is

- (a) one-one and onto (b) one-one but not onto
(c) onto but not one-one (d) neither one-one nor onto [IIT 2003]

(18) If $f(x) = (x+1)^2$ for $x \geq -1$ and $g(x)$ is the function whose graph is reflection of the graph of $f(x)$ with respect to the line $y = x$, then $g(x)$ equals

- (a) $-\sqrt{x} - 1$, $x \geq 0$ (b) $\frac{1}{(x+1)^2}$, $x > -1$
(c) $\sqrt{x+1}$, $x \geq -1$ (d) $\sqrt{x} - 1$, $x \geq 0$ [IIT 2002]

(19) If function $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined as $f(x) = 2x + \sin x$ for $x \in \mathbb{R}$, then f is

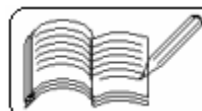
- (a) one-one and onto (b) one-one but not onto
(c) onto but not one-one (d) neither one-one nor onto [IIT 2002]

(20) If $g(x) = 1 + x - [x]$ and $f(x) = \begin{cases} -1, & x < 0 \\ 0, & x = 0, \\ 1, & x > 0 \end{cases}$ then for all x , $f[g(x)] =$

- (a) x (b) 1 (c) $f(x)$ (d) $g(x)$ [IIT 2001]

(21) If $f: [1, \infty) \rightarrow [2, \infty)$ is given by $f(x) = x + \frac{1}{x}$, then $f^{-1}(x)$ equals

- (a) $\frac{x + \sqrt{x^2 - 4}}{2}$ (b) $\frac{x}{1+x^2}$ (c) $\frac{x - \sqrt{x^2 - 4}}{2}$ (d) $1 + \sqrt{x^2 - 4}$ [IIT 2001]



(22) The domain of definition of $f(x) = \frac{\log_2(x+3)}{x^2+3x+2}$ is

- (a) $\mathbb{R} - \{-1, -2\}$ (b) $(-2, \infty)$
 (c) $\mathbb{R} - \{-1, -2, -3\}$ (d) $(-3, \infty) - \{-1, -2\}$ [IIT 2001]

(23) If $E = \{1, 2, 3, 4\}$ and $F = \{1, 2\}$, then the number of onto functions from E to F is

- (a) 14 (b) 16 (c) 12 (d) 8 [IIT 2001]

(24) If $f(x) = \frac{\alpha x}{x+1}$, $x \neq -1$, then for which value of α is $f[f(x)] = x$?

- (a) $\sqrt{2}$ (b) $-\sqrt{2}$ (c) 1 (d) -1 [IIT 2001]

(25) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be any function. Define $g: \mathbb{R} \rightarrow \mathbb{R}$ by $g(x) = |f(x)|$ for all x . Then g is

- (a) onto if f is onto (b) one-one if f is one-one
 (c) continuous if f is continuous (d) differentiable if f is differentiable [IIT 2000]

(26) The domain of definition of the function $y(x)$ as given by the equation $2^x + 2^y = 2$ is

- (a) $0 < x \leq 1$ (b) $0 \leq x \leq 1$ (c) $-\infty < x \leq 0$ (d) $-\infty < x < 1$ [IIT 2000]

(27) If the function $f: [1, \infty) \rightarrow [1, \infty)$ is defined by $f(x) = 2^{x(x-1)}$, then $f^{-1}(x)$ is

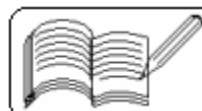
- (a) $\left(\frac{1}{2}\right)^{x(x-1)}$ (b) $\frac{1}{2}(1 + \sqrt{1 + 4\log_2 x})$
 (c) $\frac{1}{2}(1 + \sqrt{1 - 4\log_2 x})$ (d) not defined [IIT 1999]

(28) In a college of 300 students, every student reads 5 newspapers and every newspaper is read by 60 students. The number of newspapers is

- (a) at least 30 (b) at most 20 (c) exactly 25 (d) none of these [IIT 1998]

(29) If $f(x) = \frac{x^2 - 1}{x^2 + 1}$, for every real number x , then the minimum value of f

- (a) does not exist as f is unbounded (b) is equal to 1
 (c) is not attained even though f is bounded (d) is equal to -1 [IIT 1998]



(30) If $f(x) = 3x - 5$, then $f^{-1}(x)$

(a) is given by $\frac{1}{3x - 5}$ (b) is given by $\frac{x + 5}{3}$

(c) does not exist because f is not one-one

(d) does not exist because f is not onto

[IIT 1998]

(31) If $g[f(x)] = |\sin x|$ and $f[g(x)] = (\sin \sqrt{x})^2$, then

(a) $f(x) = \sin^2 x$, $g(x) = \sqrt{x}$ (b) $f(x) = \sin x$, $g(x) = |x|$

(c) $f(x) = x^2$, $g(x) = \sin \sqrt{x}$ (d) f and g cannot be determined

[IIT 1998]

(32) If $f(x) = (x + 1)^2 - 1$, ($x \geq -1$), then the set $S = \{x : f(x) = f^{-1}(x)\}$ is

(a) $\left\{0, -1, \frac{-3 + i\sqrt{3}}{2}, \frac{-3 - i\sqrt{3}}{2}\right\}$ (b) $\{0, 1, -1\}$

(c) $\{0, -1\}$

(d) empty

[IIT 1995]

(33) The number $\log_2 7$ is

(a) an integer

(b) a rational number

(c) an irrational number

(d) a prime number

[IIT 1990]

(34) If S is the set of all real x such that $\frac{2x - 1}{2x^3 + 3x^2 + x}$ is positive, then S contains

(a) $\left(-\infty, -\frac{3}{2}\right)$

(b) $\left(-\frac{3}{2}, -\frac{1}{4}\right)$

(c) $\left(-\frac{1}{4}, -\frac{1}{2}\right)$

(d) $\left(\frac{1}{2}, 3\right)$

(e) none of these

[IIT 1986]

(35) If $y = f(x) = \frac{x + 2}{x - 1}$, then

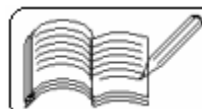
(a) $x = f(y)$

(b) $f(1) = 3$

(c) y increases with x for $x < 1$

(d) f is a rational function of x

[IIT 1984]



(36) Let $f(x) = |x - 1|$. Then

- (a) $f(x^2) = [f(x)]^2$ (b) $f(x + y) = f(x) + f(y)$
(c) $f(|x|) = |f(x)|$ (d) None of these

[IIT 1983]

(37) The domain of definition of the function $y = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$ is

- (a) $(-3, -2)$ excluding -2.5 (b) $[0, 1]$ excluding 0.5
(c) $[-2, 1]$ excluding 0 (d) None of these

[IIT 1983]

(38) Which of the following functions is periodic ?

- (a) $f(x) = x - [x]$ where $[x]$ denotes the largest integer less than or equal to the real number x
(b) $f(x) = \sin \frac{1}{x}$ for $x \neq 0$, $f(0) = 0$
(c) $f(x) = x \cos x$ (d) None of these

[IIT 1983]

(39) If X and Y are two sets, then $X \cap (X \cup Y)^c$ equals

- (a) X (b) Y (c) ϕ (d) none of these

[IIT 1979]

(40) Let R be the set of real numbers. If $f: R \rightarrow R$ is a function defined by $f(x) = x^2$, then f is

- (a) injective but not surjective (b) surjective but not injective
(c) bijective (d) none of these

[IIT 1979]

Answers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	d	a	c	a	d	b	b	d	b	a	d	b	a	b	c	b	d	a	b

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
a	d	a	d	c	d	b	c	d	b	a	c	c	a,d	a,d	d	c	a	c	d

