IITians GATE CLASSES
BANGALORE
Visit us: www.iitiansgateclasses.com
Mail us: info@iitiansgateclasses.com

GATE Aptitude Practice Questions
Basic Mathematics

Q.No. 1 A superadditive function $f(\cdot)$ satisfies the following property

$$f(x_1 + x_2) \geq f(x_1) + f(x_2)$$

Which of the following functions is a superadditive function for $x > 1$?

(A) e^x

(B) $\sqrt{x}$

(C) $1/x$

(D) e^{-x}

Q.No. 2 a, b, c are real numbers. The quadratic equation $ax^2 - bx + c = 0$ has equal roots, which is β, then

(A) $\beta = b/a$

(B) $\beta^2 = ac$

(C) $\beta^3 = bc/(2a^2)$

(D) $b^2 \neq 4ac$

Q.No. 3 For a matrix $M = [m_{ij}]$; $i, j = 1,2,3,4$, the diagonal elements are all zero and $m_{ij} = -m_{ji}$. The minimum number of elements required to fully specify the matrix is_____.

(A) 0

(B) 6

(C) 12

(D) 16

Q.No. 4 If $f(x) = x^2$ for each $x \in (-\infty, \infty)$, then $\frac{f(f(f(x)))}{f(x)}$ is equal to _____.

(A) $f(x)$

(B) $(f(x))^2$

(C) $(f(x))^3$

(D) $(f(x))^4$

Q.No. 5 Two straight lines are drawn perpendicular to each other in X-Y plane. If α and β are the acute angles the straight lines make with the X-axis, then $\alpha + \beta$ is_____.

(A) $60°$

(B) $90°$

(C) $120°$

(D) $180°$

Q.No. 6 Define $[x]$ as the greatest integer less than or equal to x, for each $x \in (-\infty, \infty)$. If $y = [x]$, then area under y for $x \in [1,4]$ is _____.

(A) 1

(B) 3

(C) 4

(D) 6

Q.No. 7 On a horizontal ground, the base of a straight ladder is 6 m away from the base of a vertical pole. The ladder makes an angle of 45° to the horizontal. If the ladder is resting at a point located at one-fifth of the height of the pole from the bottom, the height of the pole is ____ meters.

(A) 15 (B) 25 (C) 30 (D) 35

Q.No. 8 Given two sets X = {1, 2, 3} and Y = {2, 3, 4}, we construct a set Z of all possible fractions where the numerators belong to set X and the denominators belong to set Y. The product of elements having minimum and maximum values in the set Z is ____.

(A) 1/12 (B) 1/8 (C) 1/6 (D) 3/8

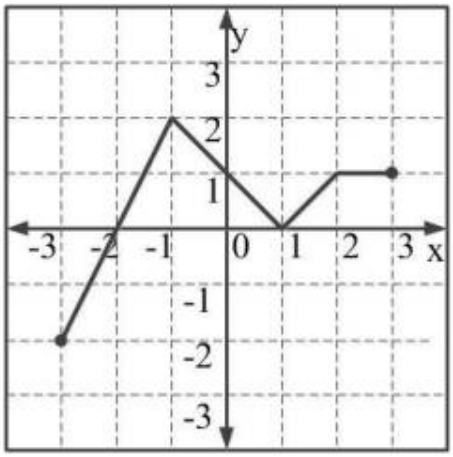
Q.No. 9 For $0 \leq x \leq 2\pi$, $\sin x$ and $\cos x$ are both decreasing functions in the interval _____.

(A) $\left(0, \frac{\pi}{2}\right)$ (B) $\left(\frac{\pi}{2}, \pi\right)$ (C) $\left(\pi, \frac{3\pi}{2}\right)$ (D) $\left(\frac{3\pi}{2}, 2\pi\right)$

Q.No. 10 If $x^2 + x - 1 = 0$ what is the value of $x^4 + \frac{1}{x^4}$?

(A) 1 (B) 5 (C) 7 (D) 9

Q.No. 11 Which of the following function(s) is an accurate description of the graph for the range(s) indicated?



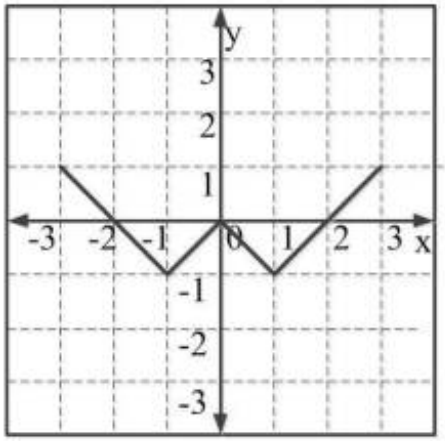
(i) $y = 2x + 4$ for $-3 \leq x \leq -1$
(ii) $y = |x - 1|$ for $-1 \leq x \leq 2$
(iii) $y = \big||x| - 1\big|$ for $-1 \leq x \leq 2$
(iv) $y = 1$ for $2 \leq x \leq 3$

(A) (i), (ii) and (iii) only.
(B) (i), (ii) and (iv) only.
(C) (i) and (iv) only.
(D) (ii) and (iv) only.

Q.No. 12 The three roots of the equation $f(x) = 0$ are $x = \{-2, 0, 3\}$. What are the three values of x for which $f(x - 3) = 0$?

(A) $-5, -3, 0$
(B) $-2, 0, 3$
(C) $0, 6, 8$
(D) $1, 3, 6$

Q.No. 13 Which of the following functions describe the graph shown in the below figure?



(A) $y = \big||x| + 1\big| - 2$
(B) $y = \big||x| - 1\big| - 1$
(C) $y = \big||x| + 1\big| - 1$
(D) $y = \big||x - 1| - 1\big|$

Q.No. 14 The expression $\frac{(x+y)-|x-y|}{2}$ is equal to

(A) the maximum of x and y
(B) the minimum of x and y
(C) 1
(D) none of the above

Q.No. 15 The number of roots of $e^x + 0.5x^2 - 2 = 0$ in the range $[-5, 5]$ is

(A) 0 (B) 1 (C) 2 (D) 3

Q.No. 16 If $|9y-6| = 3$, then $y^2 - 4y/3$ is _____.

(A) 0 (B) +1/3 (C) −1/3 (D) undefined

IITians GATE CLASSES
BANGALORE
Visit us: www.iitiansgateclasses.com
Mail us: info@iitiansgateclasses.com

Q.No. 17 If $f(x) = 2x^7 + 3x - 5$, which of the following is a factor of $f(x)$?

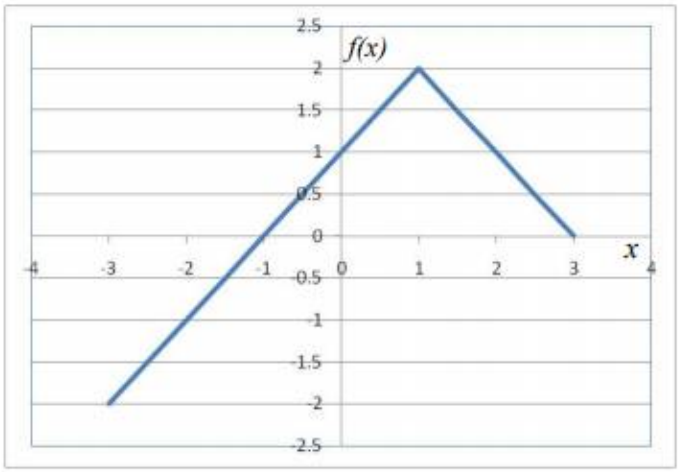
(A) (x^3+8) (B) $(x-1)$ (C) $(2x-5)$ (D) $(x+1)$

Q.No. 18 In a quadratic function, the value of the product of the roots (α, β) is 4. Find the value of

$$\frac{\alpha^n + \beta^n}{\alpha^{-n} + \beta^{-n}}$$

(A) n^4 (B) 4^n (C) 2^{2n-1} (D) 4^{n-1}

Q.No. 19



Choose the correct expression for $f(x)$ given in the graph.

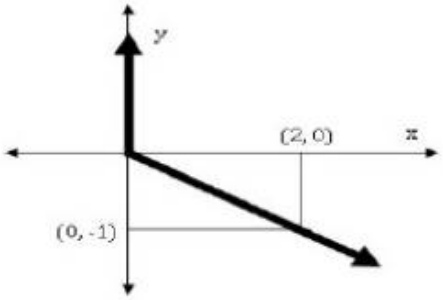
(A) $f(x) = 1 - |x - 1|$ (B) $f(x) = 1 + |x - 1|$

(C) $f(x) = 2 - |x - 1|$ (D) $f(x) = 2 + |x - 1|$

Q.No. 20 A function $f(x)$ is linear and has a value of 29 at $x = -2$ and 39 at $x = 3$. Find its value at $x = 5$.

(A) 59 (B) 45 (C) 43 (D) 35

Q.No.21 Choose the most appropriate equation for the function drawn as a thick line, in the plot below.



(A) $x = y - |y|$ (B) $x = -(y - |y|)$ (C) $x = y + |y|$ (D) $x = -(y + |y|)$

Q.No. 22 Consider a function $f(x) = 1 - |x|$ on $-1 \le x \le 1$. The value of x at which the function attains a maximum, and the maximum value of the function are:

(A) 0, −1 (B) −1, 0 (C) 0, 1 (D) −1, 2

Q.No. 23 If $y = 5x^2 + 3$, then the tangent at $x = 0, y = 3$

(A) passes through $x = 0, y = 0$
(B) has a slope of +1
(C) is parallel to the x-axis
(D) has a slope of −1

Q.No. 24 The roots of $ax^2 + bx + c = 0$ are real and positive. a, b and c are real. Then $ax^2 + b|x| + c = 0$ has

(A) no roots
(B) 2 real roots
(C) 3 real roots
(D) 4 real roots

Q.No. 25 If x is real and $|x^2 - 2x + 3| = 11$, then possible values of $|-x^3 + x^2 - x|$ include

(A) 2, 4 (B) 2, 14 (C) 4, 52 (D) 14, 52

Q.No. 26 Let $f(x, y) = x^n y^m = P$. If x is doubled and y is halved, the new value of f is

(A) $2^{n-m}P$ (B) $2^{m-n}P$ (C) $2(n-m)P$ (D) $2(m-n)P$

Q.No. 27 A political party orders an arch for the entrance to the ground in which the annual convention is being held. The profile of the arch follows the equation $y = 2x - 0.1x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is

(A) 8 meters (B) 10 meters (C) 12 meters (D) 14 meters

IITians GATE CLASSES
BANGALORE
Visit us: www.iitiansgateclasses.com
Mail us: info@iitiansgateclasses.com

Answer Key

Q. No.	Ans.
1	A
2	C
3	B
4	C
5	B
6	D
7	C
8	D
9	B
10	C
11	B
12	D
13	B
14	B
15	C
16	C
17	B
18	B
19	C

IITians GATE CLASSES
BANGALORE
Visit us: www.iitiansgateclasses.com
Mail us: info@iitiansgateclasses.com

20	C
21	B
22	C
23	C
24	D
25	D
26	A
27	B

IGC Live GATE Online Class Room Coaching

- Live online Classes for all subjects including mathematics and aptitude by subject experts (IIT/IISc Fellow)
- Good Study Material (e-form)
- Topic-wise assignments (e-form)
- 80+ online Exam
- Course completion at-least one in advance of GATE-2021
- Scholarship for GATE Qualified student and Class/Univ. Toppers
- Guaranty of best learning

Details- https://www.iitiansgateclasses.com/GATE-Online-Coaching.aspx

IGC GATE Distance Learning Program

- Detailed and well explained subject wise study material (e-form)
- Topic wise assignments and discussion (e-form)
- Weekly online exam (topic wise)
- ALL India GATE online test series
- Complete Guidance for GATE Preparation
- Online doubt clearing sessions

Details- https://www.iitiansgateclasses.com/Distance-Learning-Program.aspx

IGC GATE Online Test Series

- IGC provide 80 plus online tests to practice well before appearing for GATE.
- IGC have divided online test series in 4 parts.
  - Topic wise exam
  - Subject wise exam
  - Module wise exam
  - Complete syllabus exam

Details- https://www.iitiansgateclasses.com/gate-online-test-series.aspx

IITians GATE CLASSES: GATE Online AE | ME | ECE | EEE | INE | CSE Coaching Classes

Register for classes - https://www.iitiansgateclasses.com/register-for-classes.aspx