MATHS

BOOKS - DISHA PUBLICATION MATHS (HINGLISH)

LINEAR INEQUALITIES

Jee Main 5 Years At A Glance

1. If $f(x) = \left(\frac{3}{5}\right)^x + \left(\frac{4}{5}\right)^x - 1, x \in R,$ then the equation $f(x) = 0$ has :

A. no solution

B. one solution

C. two solutions

D. more than two solutions

Answer: (b)

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2. If $a, b,$ and c are distinct positive real numbers and $a^2 + b^2 + c^2 = 1,$ then $ab + bc + ca$ is

A. less than 1

B. equal to 1

C. greater than 1

D. any real no.

Answer: (a)

Exercise 1 Concept Builder Topic 1

1. The set of all x satisfying the inequality $\frac{4x-1}{3x+1} \geq 1$

A. $\left(-\infty, -\frac{1}{3}\right) \cup \left[\frac{1}{4}, \infty\right)$

B. $\left(-\infty, -\frac{2}{3}\right) \cup \left[\frac{5}{4}, \infty\right)$

C. $\left(-\infty, -\frac{1}{3}\right) \cup [2, \infty)$

D. $\left(-\infty, -\frac{2}{3}\right) \cup [4, \infty)$

Answer: (c)

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2. If $\frac{5-2\times}{3} \leq \frac{X}{6} - 5,$ then $X \in$

A. $[2, \infty)$

B. $[-8, 8]$

C. $[4, \infty)$

D. $[8, \infty)$

Answer: (d)

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3. The length of a rectangle is three times the breadth. If the minimum perimeter of the rectangle is 160 cm, then what can you say about breadth ?

A. breadth $= 20$

B. breadth ≤ 20

C. breadth ≥ 20

D. breadth $\neq 20$

Answer: (c)

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4. If x satisfies the inequations $2x - 7 < 11, 3x + 4 < -5,$ then x lies in the interval

A. $(-\infty, 3)$

B. $(-\infty, 2)$

C. $(-\infty, -3)$

D. $(-\infty, \infty)$

Answer: (c)

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5. If x satisfies the inequations $x + 7 < 2x + 3$ and $2x + 4 < 5x + 3$ then x lies in the interval

A. $(- \infty, 3)$

B. $(1, 3)$

C. $(4, \infty)$

D. $(- \infty, \ - 1)$

Answer: (c)

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6. The marks obtained by a student of Class XI in first and second terminal examination are 62 and 48, respectively. Find the number of minimum marks he should get in the annual examination to have an average of at least 60 marks.

A. 70

B. 50

C. 74

D. 48

Answer: (a)

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7. Find al pairs of consecutive odd natural number, both of which are larger than 10, such that their sum is less than 40.

A. 4

B. 6

C. 3

D. 8

Answer: (a)

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8. $5x + 1 > -24, 5x - 1 < 24$

A. 2

B. 3

C. 4

D. 5

Answer: (d)

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9. The set of real values of x satisfying $||x-1|-1| \leq 1$, is

A. $[-1, 3]$

B. $[0, 2]$

C. $[-1, 1]$

D. None of these

Answer: (a)

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10. Solve the inequation :

$6 \leq -3(2x-4) < 12$

A. $(-\infty, 1]$

B. $(0, 1]$

C. $(0, 1] \cup [1, \infty)$

D. $[1, \infty)$

Answer: (b)

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11. solve : $\frac{3x-4}{2} + \geq \frac{x+1}{4}$

A. $[1, \infty)$

B. $(1, \infty)$

C. $(-5, 5)$

D. $[-5, 5]$

Answer: (a)

12. A company manufactures cassettes. Its cost and revenue functions are C(x)=26000+30x and R(x)= 43x, respectively, where x is the number of cassettes produced and sold in a week. How many cassettes must be sold by the company to realise some profit ?

A. more than 2000

B. less than 2000

C. more than 1000

D. less than 1000

Answer: (a)

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13. Which of the following is the solution set of

$3x - 7 > 5x - 1 \forall x \in$ R ?

A. $(-\infty, -3)$

B. $(-\infty, -3]$

C. $(-3, \infty)$

D. $(-3, 3)$

Answer: (c)

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14. The solution set of the inequality $37 - (3x + 5) \geq 9x - 8(x - 3)$ is

A. $(-\infty, 2)$

B. $(-\infty, -2)$

C. $(-\infty, 2]$

D. $(-\infty, -2]$

Answer: (c)

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15. IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$where MA is mental age and CA is chronological age. If $80 \leq IQ \leq 140$for a

group of 12 years old children, find the range of their mental age.

A. $9.8 \leq MA \leq 16.8$

B. $10 \leq MA \leq 16$

C. $9.6 \leq MA \leq 16.8$

D. $9.6 \leq MA \leq 16.6$

Answer: (c)

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16. If x satisfies the inequations $2x - 7 < 11$ and $3x + 4 < -5$, then x lies in the interval $(-\infty, -m)$. The value of 'm' is

A. 2

B. 3

C. 4

D. 5

Answer: (b)

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17. Let $\frac{C}{5} = \frac{F-32}{9}$ If C lies between 10 and 20 then :

A. $50 < F < 78$

B. $50 < F < 68$

C. $49 < F < 68$

D. $49 < F < 78$

Answer: (b)

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Exercise 1 Concept Builder Topic 2

1. The solution set of the inequalities $3x - 7 > 2(x - 6)$ and $6 - x > 11 - 2x$, is

A. $(-5, \infty)$

B. $[5, \infty)$

C. $(5, \infty)$

D. $[-5, \infty)$

Answer: (c)

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2. The solution of the system of inequalities $3x - 7 < 5 + x$ and $11 - 5x \leq 1$ on the number line is

A. 

B. 

C. 

D. None of the above

Answer: (b)

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Exercise 1 Concept Builder Topic 3

1. The position of points O (0,0) and P $(2, -2)$ in the region of graph of inequation $2x - 3y < 5$, will be

A. O inside and P outside

B. O and P both inside

C. O and P both outside

D. O outside and P inside

Answer: (a)

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2. The region represented by $2x + 3y - 5 \geq 0$ and $4x - 3y + 2 \geq 0$ is

A. Not in first quadrant

B. Bounded in first quadrant

C. Unbounded in first quadrant

D. None of these

Answer: (b)

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3. The vertex of common graph of inequalities

$2x + y \geq 2$ and $x - y \leq 3$, is

A. $(0, 0)$

B. $\left(\frac{5}{3}, -\frac{4}{3}\right)$

C. $\left(\frac{5}{3}, \frac{4}{3}\right)$

D. $\left(-\frac{4}{3}, \frac{5}{3}\right)$

Answer: (b)

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4. The set of points (x, y) satisfying the inequalities $x + y \leq 1, -x - y \leq 1$ lies in the region bounded by the two straight lines passing through the respective pair of points

A. $\{(1, 0)(0, 1)\}$ and $\{(-1, 0), (0, -1)\}$

B. $\{(1, 0), (1, 1)\}$ and $\{(-1, 0), (0, -1)\}$

C. $\{(-1, 0), (0, -1)\}$ and $\{(1, 0), (-1, 1)\}$

D. $\{(1, 0), (1, 1)\}$ and $\{(-1, 0), (0, 1)\}$

Answer: (a)

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5. The region rprsented by the inequation system $x, y \geq 0, y \leq 6, x + y \leq 3,$ is

A. Unbounded in first quadrant

B. Unbounded in first and second quadrants

C. Bounded in first quadrant

D. None of these

Answer: (c)

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6. The graphical solution of the inequalities $x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$ is

A. 

B. 

C. 

D. 

Answer: (d)

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7. A furniture dealer deals in only items - tables and chairs. He has ₹$15,000$ to invest and a space to store atmost 60 pieces. A table costs

him ₹750 and chair ₹150 . Suppose he makes x tables any y chairs

The graphical solution of the inequations representing given data is

A. 

B. 

C. 

D. None of these

Answer: (c)

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Exercise 1 Concept Builder Topic 4

1. The largest interval for which $x^{12} + x^9 + x^4 - x + 1 > 0$ `-4

A. $-4 < x \leq 0$

B. $0 < x < 1$

C. $-100 < x < 100$

D. $-\infty < x < \infty$

Answer: (d)

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2. Prove that $\left|\frac{12x}{4x^2+9}\right| \leq 1$ for all real values of x the equality being satisfied only if $|x| = \frac{3}{2}$

A. $\frac{3}{2}$

B. $\frac{2}{3}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

Answer: (a)

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3. Number of intergral value of x satisfying the inequality $\frac{x^2+6x-7}{|x+4|}<0$ is :

A. $(-\infty, -7)$

B. $(-7, 4)$

C. $(-4, 1)$

D. $(1, \infty)$

Answer: (c)

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4. Solve: $(\log)_{0.1}\left((\log)_2\left(\frac{x^2+1}{x-1}\right)\right)<0$

A. $(1, \infty)$

B. $(-\infty, 1)$

C. $[1, \infty)$

D. None of these

Answer: (a)

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5. If $5\{x\} = x + [x]$ and $[x] - \{x\} = \frac{1}{2}$ when $\{x\}$ and $[x]$ are fractional and integral part of x then x is

A. $\frac{1}{2}$

B. $\frac{3}{2}$

C. $\frac{5}{2}$

D. $\frac{7}{2}$

Answer: (b)

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6. Solve $\left(\frac{1}{2}\right)^{x^6-2x^4} < 2^{x^2}$

A. R

B. $(0, \infty)$

C. $(-\infty, -1) \cup (-1, \infty)$

D. $(-\infty, -1) \cup (-1, 0) \cup (0, 1) \cup (1, \infty)$

Answer: (d)

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7. The solution set of $(x-2)^{x^2-6x+8} > 1$ is

A. $(2, \infty)$

B. $(2, 3) \cup (4, \infty)$

C. $(4, 5) \cup (5, \infty)$

D. $(2, 3) \cup (4, 5)$

Answer: (b)

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8. If x and y are real then the number of ordered pairs (x, y) such that $x + y + \frac{x}{y} = \frac{1}{2}$ and $(x + y)\frac{x}{y} = -\frac{1}{2}$ is

A. 1

B. 2

C. 0

D. None of these

Answer: (b)

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9. The number of integral values of x satisfying the inequality $\left(\frac{e}{4}\right)^{6x+10-x^2} < \frac{27}{64} is$ _ _ _

A. 5

B. 6

C. 7

D. 8

Answer: (c)

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10. Solution $x^{(\log_{10} x)^2 - (3\log_{10})^{x+1}} > 1000$ for $x \in R$ is

A. $(10, \infty)$

B. $(100, \infty)$

C. $(1000, \infty)$

D. $(1, \infty)$

Answer: (c)

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11. If a, b and c are three positive real numbers such that $a+b \geq c,$ then

A. $\frac{a}{1+a}+\frac{b}{1+b} \geq \frac{c}{1+c}$

B. $\frac{a}{1+a}+\frac{b}{1+b}<\frac{c}{1+c}$

C. $\frac{a}{1+a}+\frac{b}{1+b}>\frac{c}{1+c}$

D. None of these

Answer: (a)

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12. The solution of $2^x + 2^{|x|} \geq 2\sqrt{2}$ is

A. $(-\infty, \log_2(\sqrt{2}+1))$

B. $(0, \infty)$

C. $\left(\frac{1}{2}, \log_2(\sqrt{2}-1)\right)$

D. $(-\infty, \log_2(\sqrt{2}-1)] \cup \left[\frac{1}{2}, \infty\right)$

Answer: (d)

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13. If the inequality $\left(mx^2+3x+4+2x\right)/\left(x^2+2x+2\right)<5$ is satisfied for all $x \in R,$ then find the value of m.

A. $\lambda > 5$

B. $\lambda < \frac{71}{24}$

C. $\lambda < 5$

D. None of these

Answer: (b)

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14. If $\left(\sqrt{2}\right)^{x}+\left(\sqrt{3}\right)^{x}=\left(\sqrt{13}\right)^{x/2}$, then the number of real values of x is

A. 2

B. 4

C. 1

D. None of these

Answer: (c)

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15. The number of solutions of $\log_{\sin x}\left(2^{\tan x}\right) > 0$ in the interval $(0, \pi/2)$ is

A. 0

B. 1

C. 2

D. 3

Answer: (a)

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16. The number of real roots of the equation $|2-|1-|x|\,|\,|=1$ is

A. 1

B. 3

C. 5

D. 6

Answer: (c)

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Exercise 2 Concept Applicator

1. Solve $\frac{|x+3|=x}{x+2} > 1, x \in R.$

A. $x \in (-5, -2) \cup (-1, \infty)$

B. $x \in (5, 2) \cup (-1, \infty)$

C. $x \in (5, 2)$

D. $x \in (-1, \infty)$

Answer: (a)

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2. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have

A. more than 320 and less than 1000

B. more than 160 and less than 320

C. more than 320 and less than 1280

D. more than 320 and less than 640

Answer: (c)

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3. $|x+2|-|x-1|<x-\frac{3}{2}$

A. $\left(\frac{9}{2}, \infty\right)$

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

C. $\left(-2, -\frac{3}{2}\right)$

D. $\left(-1, \frac{3}{2}\right)$

Answer: (a)

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4. A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

A. more than 120 litres but less than 300 litres

B. more than 140 litres but less than 600 litres

C. more than 100 litres but less than 280 litres

D. more than 160 litres but less than 500 litres

Answer: (a)

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5. Ravi obtained 70 and 75 marks in first two unit test. Find the number if minimum marks he should get in the third test to have an average of at least 60 marks.

A. 45

B. 35

C. 25

D. 40

Answer: (b)

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6. Find all pairs of consecutive even positive integers both of which are larger than 5 such that their sum is less than 23.

A. $(4, 6), (6, 8), (8, 10), (10, 12)$

B. $(6, 8), (8, 10), (10, 12)$

C. $(6, 8), (8, 10), (10, 12), (12, 14)$

D. $(8, 10), (10, 12)$

Answer: (b)

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7. Solve the inequalities and show the graph of the solution in each case on number line :

$3x \quad 2 \quad < \quad 2x \quad + \quad 1$

A. 

B. 

C. 

D. 

Answer: (a)

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8. The number of ordered pairs (x,y) satisfying the system of equations $6^x\left(\frac{2}{3}\right)^y - 3.2^{x+y} - 8.3^{x-y} + 24 = 0, xy = 2$ is

A. 0

B. 1

C. 2

D. 3

Answer: (d)

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9. A vertex of bounded region of inequalities $x \geq 0, x + 2y \geq 0$ and $2x + y \leq 4,$ is

A. $(1, 1)$

B. $(0, 1)$

C. $(3, 0)$

D. $(0, 0)$

Answer: (d)

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10. A vertex of a feasible region by the linear constraints $3x + 4y \leq 18, 2x + 3y \geq 3$ and $x, y \geq 0,$ is

A. $(0, 2)$

B. $(4.8, 0)$

C. $(0, 3)$

D. None of these

Answer: (d)

11. A vertex of the linear in equalities $2x + 3y \leq 6, x + 4y \leq 4$ and $x, y \geq 0,$ is

A. $(1, 0)$

B. $(1, 1)$

C. $\left(\frac{12}{5}, \frac{2}{5}\right)$

D. $\left(\frac{2}{5}, \frac{12}{5}\right)$

Answer: (c)

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12. 6/ The real solutions of the equation $2^{x+2}.5^{6-x} = 10^{x^2}$ is

A. $\log_{10} 4 - 3$

B. 2

C. $-\log_{10}(250)$

D. None of these

Answer: (d)

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13. If the equation $2^x + 4^y = 2^y$ is solved for y in terms of x where $x < 0$, then the sum of the solution is $x(\log)_2(1 - 2^x)$ (b) $x + (\log)_2(1 - 2^x)$ $(\log)_2(1 - 2^x)$ (d) $x(\log)_2(2^x + 1)$

A. $x \log_2(1 - 2^x)$

B. $x + \log_2(1 - 2^x)$

C. $\log_2(1-2^x)$

D. $x\log_2(2^x+1)$

Answer: (b)

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14. the less interger a , for which

$1+\log_5\left(x^2+1\right)\leq\log_5\left(ax^2+4x+a\right)$ is

true for all $x\in$ R is -

A. 6

B. 7

C. 10

D. 1

Answer: (b)

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15. The equation $\sqrt{x+1}-\sqrt{x-1}=\sqrt{4x-1}$ has

A. no solution

B. one solution

C. two solution

D. more than two solution

Answer: (a)

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16. If $(x+1)^{(\log)_{10}(x+1)} = 100(x+1)$, then all the roots are positive real numbers all the roots lie in the interval (0,100) all the roots lie in the interval [-1,99] none of these

A. all the roots lie in the interval are positive real numbers.

B. all the roots lie in the interval $(0, 100)$.

C. all the roots lie in the interval $[-1, 99]$.

D. None of these

Answer: (c)

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17. The equation $|x+1||x-1| = a^2 - 2a - 3$ can have real solutions for x, if a belongs to

A. $(-\infty, -1] \cup [3, \infty)$

B. $[1-\sqrt{5}, 1+\sqrt{5}]$

C. $[1-\sqrt{5}, -1] \cup [3, 1+\sqrt{5}]$

D. None of these

Answer: (c)

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18. The set of all values of x satisfying $x^{\log x(1-x)^2} = 9$

A. a subset of R containing N

B. a subset of R containing Z (set of all integers)

C. is a finite set containing at least two elements

D. a finite set

Answer: (d)

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19. $\left|\frac{x+1}{x}\right| + |x+1| = \frac{(x+1)^2}{|x|}$

A. $\{x \mid x \geq 0\}$

B. $\{x \mid x > 0\} \cup \{-1\}$

C. $\{-1, 1\}$

D. $\{x\} x \geq 1$ or $x \leq -1\}$

Answer: (b)

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20. The equation $\frac{x^3}{4}\left((\log)_2 x\right)^{2+(\log)_2 x-\frac{5}{4}}=\sqrt{2}$ has (1989, 2M)

at least one real solution exactly three real solutions exactly one irrational solution complex roots

A. at most one real root

B. exactly three real solutions

C. exactly two irrational solution

D. complex roots

Answer: (b)

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21. The solution set of the inequality $\left|9^x - 3^{x+1} + 15\right| < 2.9^x - 3^x$ is

A. $(-\infty, 1)$

B. $(1, \infty)$

C. $(-\infty, 1]$

D. $(-1, \infty)$

Answer: (b)

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22. The number of solution of $|[x] - 2x| = 4$ is

A. 2

B. 4

C. 1

D. infinite

Answer: (b)

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23. If $f(x) = \frac{\frac{1}{x} + 1}{\frac{1}{x} - 1}$,then the value of $f(x) + f(-x)$ is:

A. no solution

B. one solution

C. two solutions

D. more than two solutions

Answer: (b)

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24. The system of equation $|x-1|+3y=4, x-|y-1|=2$ has

A. no solution

B. A unique solution

C. Two solutions

D. More than two solutions

Answer: (b)

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25. For $x \in R$, $f(x)$ is defined as follows :

$$f(x) = \begin{cases} x+1 & 0 \leq x < 2 \\ |x-4| & x \geq 2 \end{cases}$$

Then the solution set of the equation is $f(x)^2 + x = f(x) + x^2$ is

A. $\{-1, 1\}$

B. $[2, \infty)$

C. $[0, 2)$

D. {0,2}`

Answer: (d)

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26. The equation $|x+1|^{\log_{x+1}(3+2x-x^2)} = (x-3)|x|$ has

A. unique solution

B. two solution

C. no solution

D. more than two solutions

Answer: (c)

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27. 16.$4^x - 3^{x-\frac{1}{2}} = 3^{x+\frac{1}{2}} - 2^{2x-1}$.

A. 0

B. 1

C. 2

D. 4

Answer: (b)

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28. Consider the following ststements.

$I.$ Solution set of the inequality $-15 < \frac{3(x-2)}{5} \leq 0$ is $(-23, 2]$

$II.$ Solution set of the inequality $7 \leq \frac{3x+11}{2} \leq 11$ is $\left[1, \frac{11}{3}\right]$

$III.$ Solution set of the inequality $-5 \leq \frac{2-3x}{4} \leq 9$ is $[-1, 1] \cup [3, 5]$

Choose the correct option

A. Only I and II are true.

B. Only II and III are true.

C. Only I and III are true.

D. All are true.

Answer: (a)

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29. If $R \geq r > 0$ and $d > 0$, then $0 < \frac{d^2 + R^2 - r^2}{2dR} \leq 1$

A. is satisfied if $|d - R| \leq r$

B. is satisfied if $|d - R| \leq 2r$

C. is satisfied if $|d - R| \geq r$

D. is not satisfied at all

Answer: (a)

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30. If a, b and c are distinct positive numbers, then the expression $(a+b-c)(b+c-a)(c+a-b)-abc$ is:

A. positive

B. negative

C. non- positive

D. non-negative

Answer: (b)