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MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

BASIC ALGEBRA

Example

1. Solve $|2x - 17| = 3$ for x.

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2. Solve $3|x - 2| + 7 = 19$ for x.

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3. Solve $|2x - 3| = |x - 5|$.

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4. Solve $|x - 9| < 2$ for x

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5. Solve $\left|\frac{2}{x - 4}\right| > 1, x \neq = 4$

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6. Our monthly electricity bill contains a basic charge, which does not change with number of units used, and a charge that depends only on how many units we use. Let us say Electricity board charges Rs 110 as basic charge and charde Rs. 4 for each unit we use. If a person wants to keep his electricity bill below Rs. 250. then what should be his electricity usage

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7. Solve $3x - 5 \leq x + 1$ for x

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8. Solve the following system of linear inequalities. $3x - 9 \geq 0, 4x - 10 \leq 6.$

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9. A girl A is a reading a book having 446 pages and she has already finished reading 271 pages. She wants to finish reading this book within a week. What is the minimum number of pages she should read per day to complete reading the book within a week ?

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10. If a and b are roots of equation $x^2 - PX + Q = 0$, find the value of $\frac{1}{a} + \frac{1}{b}$.

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11. If the equation $x^2 - ax + a + 2 = 0$ has equal roots then 'a' will be :

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12. The number of solutions of $x^2 + |x - 1| = 1$ is

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13. Solve $3x^2 + 5x - 2 \leq 0.$

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14. Solve $\sqrt{x + 14} < x + 2$

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15. Solve the equation $\sqrt{6 - 4x - x^2}$ = x + 4

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16. Construt a cubic polynomial function having zero at $x = \frac{2}{5}, 1 + \sqrt{3}$ such that $f(0) = -8$

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17. Prove that $ap + q = 0$ if $f(x) = x^3 - 3px + 2q$ is divisible by $g(x) = x^2 + 2ax + a^2$.

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18. Find the roots of the polynomical equation $(x-1)^3(x+1)^2(x+5) = 0$ and state their multiplicity.

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19. Solve $x = \sqrt{x + 20}$ for $x \in R$.

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20. The equations $x^2 - 6X + a = 0$ and $x^2 - bx + 6 = 0$ have one root in common. The other root of the first one and the second equation are integers in the ratio $4:3$. Find the commonroot.

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21. Find the values of P for which the difference between the roots of the equation $x^2 +$ px + 8 = 0 is 2.

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22. Solve $\frac{x+1}{x+3} < 3$

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23. Resolve into partial fractions : $\frac{x}{(x+3)(x-4)}$.

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24. Resolve into partial fraction $\frac{2x}{(x^2+1)(x-1)}$

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25. Reslove into partial fraction: $\frac{x+1}{x^2(x-1)}$

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26. Shade the region given by the inequality $x \geq 2$

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27. Shade the region given by the linear inequality $x + 2y > 3$

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28. (i) simplify: $\left(x^{\frac{1}{2}} y^{-3}\right)^{\frac{1}{2}}$, where $x, y \geq 0$

(ii) simplify : $\sqrt{x^2 - 10x + 25}$

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29. Rationalize the denomintor of $\frac{\sqrt{5}}{\left(\sqrt{6}\right)+\sqrt{2}}$

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30. Find the squre root of $7-4\sqrt{3}$

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31. Find the logarithm of 1728 to the base $2\sqrt{3}$.

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32. If the logarithm of 324 to base a is 4, then find a .

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33. Prove $\log \frac{75}{16} - 2\log \frac{5}{9} + \log \frac{32}{243} = \log 2.$

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34. If $\log_2 x + \log_4 x + \log_{16} x = \frac{7}{2}$, find the value of x.

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35. Solve $x^{\log_3 x} = 9$

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36. compute $\log_3 5 \log_{25} 27$

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37. Given that $\log_{10} 2 = 0.30103, \quad \log_{10} 3 = 0.47712$ (approximately), find the number of digits in $2^8, 3^{12}$.

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Additional Question Sloved

1. Prove that $0.33333.... = \frac{1}{3}$

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2. Solve $\frac{4}{x+1} \leq 3 \leq \frac{6}{x+1}, x > 0$

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3. Solve $\frac{|x_2| - 1}{|x-2| - 2} \leq 0$

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4. Solve: $\frac{1}{|x| - 3} \leq \frac{1}{2}$

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5. Solve: $|x-1| \leq 5, |x| \geq 2$

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6. Solve : $\left|x-\frac{1}{4}\right| < \left|\frac{1}{2}x-\frac{3}{4}\right|$

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

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8. To receive Grade A in a course , one must obtain an averager of 90 marks or more in five examinations (each 0f 100 marks). If sunita 's' marks in first four examinations are 87, 92,94 and 95, find minimum marks that sunita must obtain in fifth examination to get Grade 'A' in the course.

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9. Find the pairs of consecutive odd positive intergers both of which are smaller than 10 such that their sum is more than 11.

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

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11. Forensic scientists use $h = 61.4 + 2.3F$ To predict the right h in centimeters for a female whose thigh bone (femur) measures F cm . If the height of the female lies between 160 to 170 cm find the range of values for the length of the thigh bone ?

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12. Find the values of k so that the equation $x^2 - 2x(1+3k) + 7(3+2k) = 0$ has real and equal roots.

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13. If the sum and product of the roots of the equation $ax^2 - 5x + c = 0$ are both equal to 10 then find the values of a and c.

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14. IF α and β are the roots of the equation $3x^2 - 4x + 1 = 0$, form the equation whose roots are

$\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.

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15. If one root of the equation $3x^2 + kx - 81 = 0$ is the square of the other then find k.

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16. If one root of the equation $2x^2 - ax + 64 = 0$ is twice that of the other find the value of a.

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17. Solve $2x + 1 = x - 2$

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18. Solve $\frac{2x - 1}{x} > -1$

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19. Solve $\frac{x + 1}{x - 1} > 0$

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20. Find the zero of the polynomial function $f(x) = 9x^2 - 36$

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21. If $x = 2$ is one the of roots of $x^3 + 2x^2 - 5x - 6 = 0$ then find the other roots of the equation

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22. Solve for $x^2 + 10x + 5 = 0$

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23. Solve the equation $x^3 + 5x^2 - 16x - 14 = 0$ given $x + 7$ is a root

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24. Resolve into partial fractions $\frac{3x+7}{x^2-3x+2}$

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25. Resolve into partial fractions $\frac{5x-4}{(x^2-x-2)}$

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26. Resolve into partial fractions $\frac{x^2-2x-9}{(x+1)(x^2+x+6)}$

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27. Solve:$x + y = 4, 2x - y = 0$

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28. Simplify $(343)^{\frac{2}{3}}$

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29. Solve $(x + 1) = \sqrt{x - 3}$

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30. Solve $\log_{16} x + \log_4 x + \log_2 x = 7$

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31. Solve $\log_5 \sqrt{7x-4} - \frac{1}{2} = \log_5 \sqrt{x+2}$

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32. If $a^2 + b^2 = 23ab$ prove that $\log \frac{a+b}{5} = \frac{1}{2}(\log a + \log b)$

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Exercise 2 1

1. Classify each element of $\left\{\sqrt{7}, \frac{-1}{4}, 0, 3.14, 4, \frac{22}{7}\right\}$ as a member of $\mathbb{N}, \mathbb{Q}, \mathbb{R}-\mathbb{Q}$ or $\mathbb{Z}$.

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2. Prove that $\sqrt{3}$ is an irrational number. (Hint: Follow the method that we have used to prove $\sqrt{2} \notin \mathbb{Q}$.)

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3. Are there two distinct irrational numbers such that their difference is a rational number? Justify

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4. Find two irrational numbers such that their sum is a rational number. Can you find two irrational numbers whose product is a rational number.

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5. Find a positive number small than $\frac{1}{2^{100}}$. Justify.

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Exercise 2 2

1. Solve for x

$|3 - x| < 7$

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2. Solve $\frac{1}{|2x-1|} < 6$ and express the solution using the interval notation.

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3. Solve -3 |x|+ 5 $\leq$ -2 and graph the solution set in a number line.

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4. Solve 2|x + 1| - 6 $\leq$ 7 and graph the solution set in a number line.

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5. Solve $\frac{1}{5}|10x - 2| < 1.$

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6. Solve $|5x - 12| < -2.$

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Exercise 2 3

1. Represent the following inequalities in the interval notation:

$x \geq -1$ and $x < 4$

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2. Solve -2x $\geq$ 9 when

x is a real number

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3. Solve:

$$\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$$

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4. To secure A grade one must obtain an average of 90 marks or more in 5 subjects each of maximum 100 marks. If one scored 84,87,95,91 in first four subjects, what is the minimum mark one scored in the fifth subject to get A grade in the course?

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

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6. Find all pairs of consecutive odd natural numbers both of which are larger than 10 and their sum is less than 40.

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7. A model rocket is launched from the ground. The height 'h' reached by the rocket after t seconds from lift off is given by h(t) = $-5t^2 + 100t, 0 \leq t \leq 20$. At what time the rocket is 495 feet above the ground?

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8. A plumber can be paid according to the following schemes, In the first scheme he will be paid rupees 500 plus rupees 70 per hour, and in the second scheme he will paid 120 rupees per hour. If he works x hours. Then for what value of x does the first scheme give better wages?

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9. A and B are working on similar jobs but their annual salaries differ by more than ₹ 6000. if B earns rupees 27000 per month, then what are the possibilities of A`s salary per month?

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Exercise 2 4

1. Construct a quadratic equation with roots 7 and -3 .

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2. A quadratic polynomial has one of its zeros as $1 + \sqrt{5}$ and it satisfies p(1) = 2. find the quadratic polynomial.

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3. If α and β are the roots of the quadratic equcation $x^2 + \sqrt{2}x + 3 = 0$, form a quadratic polynomial with zeroes $\frac{1}{\alpha}, \frac{1}{\beta}$.

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4. If one root $k(x-1)^2 = 5x - 7$ is double the other root, show that k = 2 or - 25.

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5. If the difference of the roots of the equation $2x^2 - (a+1)$x + a -1 = 0 ` is equal to their product, then prove that a = 2.

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6. Find the condition that one of the roots of $ax^2 + bx + c$ may be

(i) negative of the other,

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7. If the equations $x^2 - ax + b = 0$ and $x^2 - ex + f = 0$ have one root in common and if the second equation has equal roots, then prove that ae = 2 (b + f).

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8. Disuss that nature of roots of

(i) $-x^2 + 3x + 1 = 0$ (ii) $4x^2 = 0$ (iii) $9x^2 + 5x = 0$

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9. Without sketching the graphs, find whether the graphs of the following functions will intersect the x-axis and if so in how many points.

$y = x^2 + 6x + 9$

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10. Write $f(x) = x^2 + 5x + 4$ in completed square form.

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Exercise 2 5

1. Solve $2x^2 + x - 15 \leq 0.$

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2. Solve $-x^2 + 3x - 2 \geq 0$

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Exercise 2 6

1. Find the zero of the polynomial function $f(x) = 4x^2 - 25$

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2. If x = -2 is one root of $x^3 - x^2 - 17x = 22$. Then find the other roots of the equation.

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3. Find the real the real roots of $x^4 = 16$

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4. Solve $(2x + 1)^2 - (3x + 2)^2 = 0$

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Exercise 2 7

1. Factorize : $x^2 + 1$. (Hint : Try completing the square)

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2. If $x^2 +$ x + 1 is a factor of the polynomial $3x^3 + 8x^2 + 8x + a$, then find the value of a.

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Exercise 2 8

1. Find all value of x for which $\frac{x^3(x-1)}{(x-2)} > 0$

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2. Find all values of x that satisfies the inequality $\frac{2x-3}{(x-2)(x-4)} < 0$

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3. Solve: $\frac{x^2-4}{x^2-2x-15} \leq 0.$

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Exercise 2 9

1. Resolve the following rational expressions into partial fractions.(1) $\frac{1}{x^2-(a^2)}$

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2. $\frac{3x+1}{(x-2)(x+1)}$

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3. Resolve the following rational expression into partial fractions.

$$\frac{x}{(x^2+1)(x-1)(x+2)}$$

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4. Resolve the rational expressions into partial fractions

$$\frac{x}{(x-1)^3}$$

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5. Resolve the rational expressions into partial fractions

$$\frac{(x-2)^2}{x^3+x}$$

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6. Resolve the following rational expression into partial fractions.

$$\frac{x^2+x+1}{x^2-5x+6}$$

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7. Resolve the following rational expression into partial fractions.

$$\frac{x^3 + 2x + 1}{x^2 + 5x + 6}$$

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8. Resolve the following rational expression into partial fractions.

$$\frac{x + 12}{(x + 1)^2(x - 2)}$$

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9. Resolve the following rational expression into partial fractions.

$$\frac{6x^2 - x + 1}{x^3 + x^2 + x + 1}$$

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10. Resolve the following rational expression into partial fractions.

$$\frac{2x^2 + 5x - 11}{x^2 + 2x - 3}$$

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11. Resolve the following rational expression into partial fractions.

$$\frac{7 + x}{(1 + x)(1 + x^2)}$$

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Exercise 2 10

1. Determine the region in the plane determined by the inequalities.

$x \leq 3y, x \geq y$

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2. Determine the region in the plane determined by the inequalities.

$y \geq 2x, \ -2x + 3y \leq 6.$

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3. Determine the region in the plane determined by the inequalities.

$2x + 3y \leq 6, x + 4y \leq 4, x \geq 0, y \geq 0.$

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4. Determine the region in the plane determined by the inequalities.

$x - 2y \geq 0, 2x - y \leq -2, x \geq 0, y \geq 0.$

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5. Determine the region in the plane determined by the inequalities.

$2x + y \geq 8, x + 2y \geq 8, x + y \leq 6.$

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Exercise 2 11

1. Simplify :

$(125)^{\frac{1}{3}}$

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2. Evaluate $\left[\left((256)^{-\frac{1}{2}}\right)^{-\frac{1}{4}}\right]^{3}$

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3. If $\left(x^{+\frac{1}{2}}+x^{-\frac{1}{2}}\right)^2=\frac{9}{2}$, then find the value of $\left(x^{\frac{1}{2}}-x^{-\frac{1}{2}}\right)$ for $x>1$.

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4. Simplify and hence find the value of n: $\frac{3^{2n}9^2 3^{-n}}{3^{3n}}$ = 27

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5. Find the radius of the spherical tank whose volume is $32\frac{\pi}{3}units.$

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6. Simplify by ratonalising the denominator $\frac{7+\sqrt{6}}{3-\sqrt{2}}$

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7. Simplify

$$\frac{1}{3-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}$$

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8. If $x=\sqrt{2}+\sqrt{3}$ find $\frac{x^2+1}{x^2-2}$

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Exercise 2 12

1. Let b $>$ 0 and b $\neq$ 1. Express y = b^x in logarithmic form. Also state the domain and range of the logarithmic function.

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2. Compute $\log_9^{27} - \log_{27}^9$

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3. solve : $\log_8 x + \log_4 x + \log_2 x = 11.$

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4. solve : $\log_4 2^{8x} = 2^{\log_2^8}$

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5. If $a^2 + b^2 = 7ab$, show that $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}$ (log a + log b).

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6. Prove $\log\frac{a^2}{bc} + \log\frac{b^2}{ca} + \log\frac{c^2}{ab} = 0.$

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7. Prove that $\log 2 + 16\log\frac{16}{15} + 12\log\frac{25}{24} + 7\log\frac{81}{80} = 1.$

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8. Prove that $\log_{a^2} a \quad \log_{b^2} b \log_{c^2} c = \frac{1}{8}$.

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9. Prove that

$$\log a + \log a^2 + \log a^3 + \ldots + \log a^n = \frac{n(n+1)}{2} \log a$$

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10. If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$, then prove that xyz = 1.

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11. Solve: $\log_2 x - 3\log_{\frac{1}{2}} x = 6$

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12. Solve $\log_{5-x}\left(x^2 - 6x + 65\right) = 2$

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Exercise 2 13

1. If $|x + 2| \leq 9$, then x belongs to

A. $9 - \infty, -7)$

B. $[-11, 7]$

C. $(-\infty, 7) \cup [11. \infty)$

D. $(-11, 7)$

Answer: B

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2. Given that x, y and b are real numbers x $<$ y, b $>$ 0, then

A. $xb < yb$

B. $xb > yb$

C. $xb \leq yb$

D. $\frac{x}{b} \geq \frac{y}{b}$

Answer: A

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3. If $\frac{|x-2|}{x-2} \geq 0$, then x belongs to

A. $(2, \infty)$

B. $(2, \infty)$

C. $(-\infty, 2)$

D. $(-2, \infty)$

Answer: B

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4. The solution of $5x - 1 < 24$ and $5x + 1 > -24$ is .....

A. $(4, 5)$

B. $(-5, -4)$

C. $(-5, 5)$

D. $(-5, 4)$

Answer: C

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5. The solution set of the following inequality $|x - 1| \leq |x - 3|$ is

A. $(0, 2)$

B. $(2, \infty)$

C. $(0, 2)$

D. $(-\infty, 2)$

Answer: B

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6. The value of $\log_{\sqrt{2}} 512$ is .....

A. 16

B. 18

C. 9

D. 12

Answer: B

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7. The value of $\log_3 \frac{1}{81}$ is .....

A. -2

B. -8

C. -4

D. -9

Answer: C

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8. If $\log_{\sqrt{x}} 0.25 = 4$ then the value of x is .....

A. 0.5

B. 2.5

C. 1.5

D. 1.25

Answer: A

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9. The value of $\log_a b \log_b c \log_c$ a is

A. 2

B. 1

C. 3

D. 4

Answer: B

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10. If 3 is the logarthim of 343, then the base is .....

A. 5

B. 7

C. 6

D. 9

Answer: B

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11. Find a so that the sum and product of the roots of the equation $2x^2 + (a-3)x + 3a - 5 = 0$ are equal is .....

A. 1

B. 2

C. 0

D. 4

Answer: B

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12. If a and b are roots of the equation $x^2 - kx + 16 = 0$ and satisfy $a^2 + b^2 = 32$ then the value of k is

A. 10

B. -8

C. (-8.8)

D. 6

Answer: C

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13. The number of solutions of $x^2 + |x - 1| = 1$ is

A. 1

B. 0

C. 2

D. 3

Answer: C

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14. The equation whose roots are numerically equal but opposite in sign to the roots of $3x^2 - 5x - 7 = 0$ is

A. $3x^2 - 5x - 7 = 0$

B. $3x^2 + 5x - 7 = 0$

C. $3x^2 - 5x + 7 = 0$

D. $3x^2 + x - 7 = 0$

Answer: B

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15. If 8 and 2 are the roots of x^2 + ax + c = 0 and 3,3 are the roots of x^2+ dx + b = 0, then the roots of the equation $x^2 + ax + b = 0$ are

A. 1,2

B. $-1, 1$

C. 9,1

D. $-1, 2$

Answer: C

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16. If a and b are the real roots of the equation $x^2 - kx + c = 0$, then the distance between the points $(a, 0)$ and $(b, 0)$ is .....

A. $\sqrt{k^2 - 4c}$

B. $\sqrt{4k^2 - c}$

C. $\sqrt{4c - k^2}$

D. $\sqrt{k - 8c}$

Answer: A

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17. If $\frac{kx}{(x+2)(x-1)} = \frac{2}{x+2} + \frac{1}{x-1}$, then the value of k is

A. 1

B. 2

C. 3

D. 4

Answer: C

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18. If $\frac{kx}{(x+2)(x-1)} = \frac{2(x-1)+1(x+2)}{(x+2)(x-1)}$

$= \frac{3x}{x+2}(x-1) \Rightarrow kx = 3\xi mpliesk = 3$

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

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

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

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

Answer: A

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19. The number of roots of $(x+3)^4 + (x+5)^4 = 16$ is

A. 4

B. 2

C. 3

D. 0

Answer: A

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20. The value of $\log_3 11.\ \log_{11} 13.\ \log_{13} 15.\ \log_{15} 27.\ \log_{27} 81$ is

A. 1

B. 2

C. 3

D. 4

Answer: D