

Subject areas:

- Absolute value of a real number.
- Equations and inequalities.
- Systems of linear equations.
- Powers, Logarithmic and exponential functions.
- Logarithmic and exponential equations and inequalities.
- Quadratic equations and inequalities.
- Domains of the real functions.
- Trigonometric functions and equations.
- Series, arithmetic and geometric series.
- The sum of the first n terms of the arithmetic or geometric series.
- Complex numbers, absolute value of a complex number, Moivre's theorem.
- Combinatorics, k -permutations and k -combinations without repetitions.
- Binomial theorem.
- Analytical geometry (coordinate geometry), parametric equation of the line, general equation of the line, equation of the circle.

- (1) The word "function" means real function of one real variable.
 - (2) The "domain of the real function of one real variable" means the set of all the real numbers, for which the function f has a real value (i. e. all $x \in R$, for which it is $f(x) \in R$).
 - (3) There is only one correct answer is the question.
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Tasks for 5 points each

1. The set of all real numbers, which satisfy $\log_{\frac{1}{2}} x > 0$, is:

- a) $(\frac{1}{2}, +\infty)$, b) $(1, +\infty)$, c) $(0, 1)$ d) $(\frac{1}{2}, 1)$, e) None of the previous answers are correct
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2. The lot contains 45 items. How many ways can we choose two items for inspection from this lot.

- a) 1980 b) 90 c) 990 d) 180 e) None of the previous answers are correct
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3. The number $\log_3 \frac{\sqrt[3]{3}}{\sqrt{3}}$ equals:

- a) $\frac{1}{6}$, b) $-\frac{1}{6}$, c) $\frac{3}{2}$, d) $\frac{2}{3}$, e) None of the previous answers are correct
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4. The fraction $\frac{3\sqrt{7}-7\sqrt{3}}{|\sqrt{3}-\sqrt{7}|}$ equals:

- a) $-\sqrt{21}$, b) $\sqrt{3}$, c) $\sqrt{7}$, d) $\sqrt{21}$, e) None of the previous answers are correct
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5. The third number a_3 of an arithmetic series, which satisfies $a_4 + a_6 = 20$ and $a_1 + a_5 = 12$, equals:

- a) -6 b) -3 c) 3 d) 6 e) None of the previous answers are correct
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6. General equation of the line in the plane, which goes through point $A = [1, 2]$ and is perpendicular to the line $p : 3x - 2y + 1 = 0$, can be written as:

- a) $2x + 3y - 8 = 0$ b) $2x - 3y + 4 = 0$ c) $2x - 3y - 1 = 0$ d) $3x + 2y - 7 = 0$ e) None of the previous answers are correct
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7. The real part of the complex number $z = 1 + i - i^2 + i^3 - i^4$ equals:

- a) -1, b) 0, c) 1, d) -2, e) None of the previous answers are correct
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8. The number of all $x \in (\pi, 2\pi)$ which satisfy the equation $\sin x = \frac{3}{7}$, equals:

a) 0, b) 1, c) 2, d) 3, e) None of the previous answers are correct

9. The set of all real numbers which satisfy $4x - x^2 > 0$ is:

a) $(4, +\infty)$, b) $(-\infty, 4)$, c) $(-\infty, 0) \cup (4, +\infty)$, d) $(0, 4)$ e) None of the previous answers are correct

10. $\binom{40}{3} + \binom{40}{38}$ equals:

a) $\binom{41}{2}$, b) $\binom{41}{3}$, c) $\binom{40}{39}$, d) $\binom{40}{4}$, e) None of the previous answers are correct

Tasks for 10 points each

11. The domain of the function $f(x) = \frac{1}{\sqrt{|x+1|-|2x-1|+3}}$ is the set:

a) $(-\infty, -1) \cup (5, +\infty)$ b) $(-\infty, -5) \cup (-1, +\infty)$ c) $(-\infty, 1) \cup (5, +\infty)$ d) $(-1, 5)$ e) None of the previous answers are correct

12. How many elements there are, if the number of 2-permutations that can be made from them without repetitions is by 21 larger than the number of 2-combinations that can be made of them without repetitions.

a) 6 b) 7 c) 8 d) 9 e) None of the previous answers are correct

13. All the roots of the equation $16^x - 5 \cdot 4^x = -4$ are in the interval:

a) $(1, 3)$ b) $\langle 0, 1 \rangle$ c) $\langle 3, 7 \rangle$ d) $(5, 9)$ e) None of the previous answers are correct

14. There is a triangle in the plane, it has vertices $P = [-2, 8]$, $Q = [-1, 1]$ and $R = [6, 2]$. The radius of the circle that circumscribes this triangle is equal to:

a) 6, b) 5, c) 4, d) 3, e) None of the previous answers are correct

15. The domain of the function $f(x) = \log(|6 - 2x| - |4 + 2x| + 3)$ is the set:

a) $(-\infty, \frac{5}{4})$, b) $(-\infty, -\frac{5}{4})$, c) $(\frac{5}{4}, +\infty)$, d) $(-\frac{5}{4}, +\infty)$, e) None of the previous answers are correct
