

Trigonometry Exam questions

1. Classical definition and basic properties of trigonometric functions.
2. Trigonometric functions and properties of an arbitrary angle.
3. Trigonometric functions of an arbitrary numerical argument.
4. Signs of the functions of sine, cosine and cotangent in coordinate quarters.
5. One of the main properties of the sine function: $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ proof
6. Addition theorem for cosine.
7. Addition theorem for sine.
8. Addition theorem for tangent.
9. Arguments of trigonometric functions: $-\pi, \frac{\pi}{2} \pm \alpha, \pi \pm \alpha$ reduction formulas.
10. Arguments of trigonometric functions: $\frac{3}{2}\pi \pm \alpha, 2\pi \pm \alpha$ reduction formulas.
11. Formulas for dividing arguments for the cosine function.
12. Formulas for dividing arguments for the sine function.
13. Formulas for dividing arguments for the tangent function.
14. Formula for converting the sum from the product of two cosines.
15. Formula for converting the sum from the product of two sines.
16. Formula for converting the sum from the product of sine and cosine.
17. Formula for converting the algebraic sum of two cosines into a product.
18. Formula for converting the algebraic sum of two sines into a product.
19. Formula for converting the algebraic sum of two tangents into a product.
20. Transition to polar coordinates by entering an auxiliary angle.
21. Sum conversion $a \sin \alpha x + b \cos \alpha x$.
22. Converting the algebraic sum of two numbers into a product by introduction auxiliary angle.
23. Transformation of an expression $\frac{a-b}{a+b}$ by introducing an auxiliary angle.
24. Transformation of an expression $a^2 \pm b^2$ by introducing an auxiliary angle.
25. Study of the sine function with numerical arguments.
26. Study of the cosine function with numerical arguments.
27. Study of the tangent function with numerical arguments.
28. Study of cotangent with numerical arguments.
29. Periodicity of trigonometric functions.
30. Intervals on which the signs of trigonometric functions with numerical arguments remain constant.
31. Intervals on which trigonometric functions are monotonic; their greatest and lowest value.
32. Continuity of trigonometric functions.
33. Graphs of sine and cosine functions.
34. Graphs of tangent and cotangent functions.
35. Study of the arcsine function.
36. Study of the arc cosine function.
37. Study of the arctangent function.
38. Trigonometric operations on arc functions.
39. Relationship between arc functions.
40. Solving a trigonometric equation $\cos x = m$.
41. Solving a trigonometric equation $\sin x = m$.
42. Solving a trigonometric equation $tgx = m$.
43. Solving a trigonometric equation $ctgx = m$.

44. Solving some trigonometric equations using the substitution method.
45. Solving trigonometric equations of type $a \sin x + b \cos x = c$.
46. Universal replacement method for solving trigonometric equations.
47. Addition theorem for cotangent.
48. Various special cases of solving trigonometric equations.
49. Application of trigonometry: the theorem of sines in triangles.
50. Application of trigonometry: triangle design theorem.
51. Application of trigonometry: the theorem of cosines in triangles.
52. Application of trigonometry: tangent theorem in triangles.
53. Application of trigonometry: Molweid's formula for triangles.
54. Application of trigonometry: formulas for the areas of triangles.
55. Power series for the sine function.
56. Power series for the cosine function.
57. Euler formulas for the sine and cosine functions.
58. Solving a system of trigonometric equations .
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61. Solving a system of trigonometric equations .
62. Solving a system of trigonometric equations .
63. Solving a system of trigonometric equations .
64. Proof of inequality $|\sin x| < |x|$, with $x \neq 0$.
65. Proof of inequality $1 - \cos x < \frac{x^2}{2}$, with $x \neq 0$.
66. Proof of the formula for the derivative of a function $y = \sin x$.
67. Proof of the formula for the derivative of a function $y = \arcsin x$.
68. Formulas for derivatives of simple trigonometric functions (proof of one of them).
69. Formulas for derivatives of inverse trigonometric functions (proof of one of them).
70. Calculation of the sum of cosines, where the arguments form an arithmetic progression.
71. Calculation of the sum of sines, where the arguments form an arithmetic progression.
72. Calculation of the product $\prod_{k=0}^{n-1} \sin\left(x + k \frac{\pi}{n}\right)$.
73. Calculation of the product $\prod_{k=0}^{n-1} \cos\left(x + k \frac{\pi}{n}\right)$.