

Основные формулы тригонометрии

$$1. \cos^2 \alpha + \sin^2 \alpha = 1$$

$$2. \operatorname{tg} \alpha = \frac{\sin \alpha}{\cos \alpha}$$

$$3. \operatorname{ctg} \alpha = \frac{\cos \alpha}{\sin \alpha}$$

$$4. \operatorname{tg} \alpha \cdot \operatorname{ctg} \alpha = 1$$

$$5. \operatorname{tg} \alpha = \frac{1}{\operatorname{ctg} \alpha}$$

$$6. \operatorname{ctg} \alpha = \frac{1}{\operatorname{tg} \alpha}$$

$$7. 1 + \operatorname{tg}^2 \alpha = \frac{1}{\cos^2 \alpha}$$

$$8. 1 + \operatorname{ctg}^2 \alpha = \frac{1}{\sin^2 \alpha}$$

$$9. \sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$10. \sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$11. \cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$12. \cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$13. \operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$$

$$14. \operatorname{tg}(\alpha - \beta) = \frac{\operatorname{tg} \alpha - \operatorname{tg} \beta}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$$

$$15. \operatorname{ctg}(\alpha + \beta) = \frac{\operatorname{ctg} \alpha \cdot \operatorname{ctg} \beta - 1}{\operatorname{ctg} \beta + \operatorname{ctg} \alpha}$$

$$16. \operatorname{ctg}(\alpha - \beta) = \frac{\operatorname{ctg} \alpha \cdot \operatorname{ctg} \beta + 1}{\operatorname{ctg} \beta - \operatorname{ctg} \alpha}$$

$$17. \sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$18. \cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$19. \cos 2\alpha = 2 \cos^2 \alpha - 1$$

$$20. \cos 2\alpha = 1 - 2 \sin^2 \alpha$$

$$21. \operatorname{tg} 2\alpha = \frac{2 \operatorname{tg} \alpha}{1 - \operatorname{tg}^2 \alpha}$$

$$22. \operatorname{ctg} 2\alpha = \frac{\operatorname{ctg}^2 \alpha - 1}{2 \operatorname{ctg} \alpha}$$

$$23. \left| \sin \frac{\alpha}{2} \right| = \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$24. \left| \cos \frac{\alpha}{2} \right| = \sqrt{\frac{1 + \cos \alpha}{2}}$$

$$25. \operatorname{tg} \frac{\alpha}{2} = \frac{\sin \alpha}{1 + \cos \alpha} = \frac{1 - \cos \alpha}{\sin \alpha}$$

$$26. \operatorname{ctg} \frac{\alpha}{2} = \frac{\sin \alpha}{1 - \cos \alpha} = \frac{1 + \cos \alpha}{\sin \alpha}$$

$$27. \sin \alpha + \sin \beta = 2 \sin \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$$

$$28. \sin \alpha - \sin \beta = 2 \sin \frac{\alpha - \beta}{2} \cdot \cos \frac{\alpha + \beta}{2}$$

$$29. \cos \alpha + \cos \beta = 2 \cos \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$$

$$30. \cos \alpha - \cos \beta = -2 \sin \frac{\alpha + \beta}{2} \cdot \sin \frac{\alpha - \beta}{2}$$

$$31. \operatorname{tg} \alpha + \operatorname{tg} \beta = \frac{\sin(\alpha + \beta)}{\cos \alpha \cdot \cos \beta}$$

$$32. \operatorname{tg} \alpha - \operatorname{tg} \beta = \frac{\sin(\alpha - \beta)}{\cos \alpha \cdot \cos \beta}$$

$$33. \sin^2 \alpha = \frac{1}{2}(1 - \cos 2\alpha)$$

$$34. \cos^2 \alpha = \frac{1}{2}(1 + \cos 2\alpha)$$

$$35. \sin \alpha \cdot \cos \alpha = \frac{1}{2} \sin 2\alpha$$

$$36. (\sin \alpha + \cos \alpha)^2 = 1 + \sin 2\alpha$$

$$37. \sin \alpha \cdot \cos \beta = \frac{1}{2}(\sin(\alpha + \beta) + \sin(\alpha - \beta))$$

$$38. \cos \alpha \cdot \cos \beta = \frac{1}{2}(\cos(\alpha + \beta) + \cos(\alpha - \beta))$$

$$39. \sin \alpha \cdot \sin \beta = \frac{1}{2}(\cos(\alpha - \beta) - \cos(\alpha + \beta))$$

$$40. \sin x = a; |a| \leq 1$$

$$x = (-1)^n \arcsin a + \pi n, n \in \mathbb{Z}$$

$$41. \cos x = a; |a| \leq 1$$

$$x = \pm \arccos a + 2\pi n, n \in \mathbb{Z}$$

$$\operatorname{tg} x = a$$

$$42. x = \operatorname{arctg} a + \pi n, n \in \mathbb{Z}$$

$$\operatorname{ctg} x = a$$

$$43. x = \operatorname{arcctg} a + \pi n, n \in \mathbb{Z}$$

$$\sin x = 0$$

$$44. x = \pi n, n \in \mathbb{Z}$$

$$\cos x = 0$$

$$45. x = \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$$

$$\sin x = 1$$

$$46. x = \frac{\pi}{2} + 2\pi n, n \in \mathbb{Z}$$

$$\cos x = 1$$

$$47. x = 2\pi n, n \in \mathbb{Z}$$

$$\sin x = -1$$

$$48. x = -\frac{\pi}{2} + 2\pi n, n \in \mathbb{Z}$$

$$\cos x = -1$$

$$49. x = \pi + 2\pi n, n \in \mathbb{Z}$$

$$50. \cos(-x) = \cos x \quad \operatorname{tg}(-x) = -\operatorname{tg} x$$

$$\sin(-x) = -\sin x \quad \operatorname{ctg}(-x) = -\operatorname{ctg} x$$