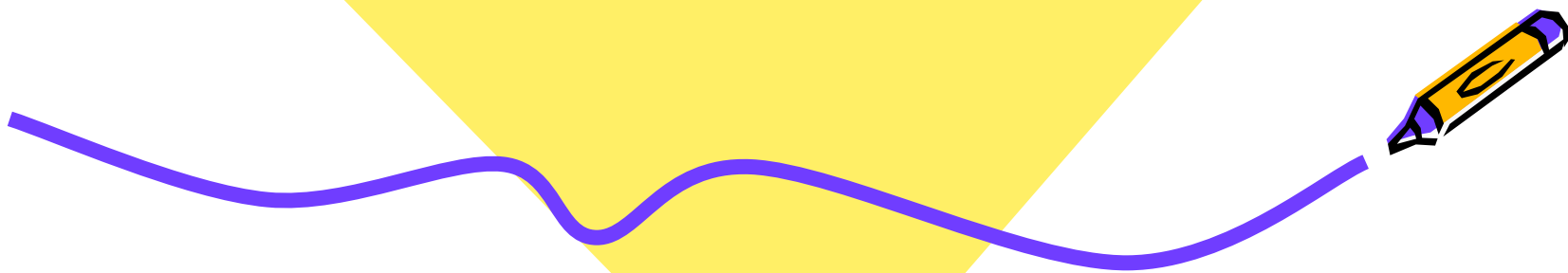




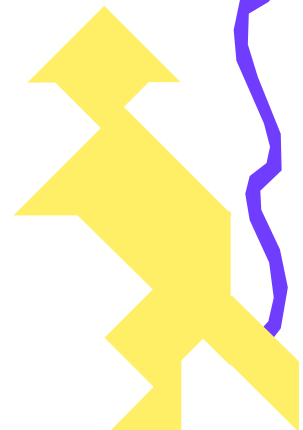
Алгебра 11 класс

ТРИГОНОМЕТРИЯ



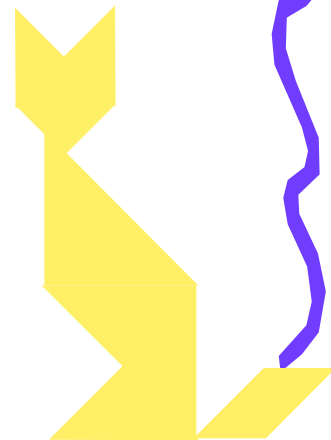


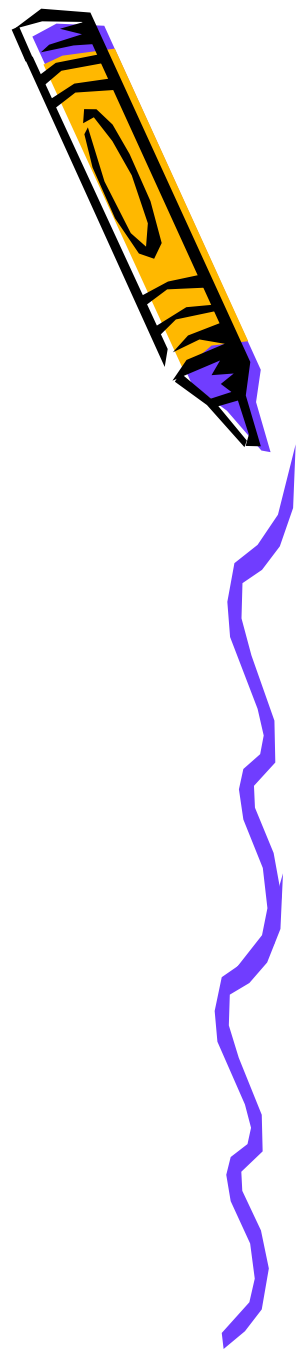
- $\sin x = a/c$
- $\cos x = b/c$
- $\operatorname{tg} x = a/b = \sin x / \cos x$
- $\operatorname{ctg} x = b/a = \cos x / \sin x$
- $\sin (\pi - \alpha) = \sin \alpha$
- $\sin (\pi/2 - \alpha) = \cos \alpha$





- $\cos (\pi/2 -\alpha) = \sin \alpha$
- $\cos (\alpha + 2\pi k) = \cos \alpha$
- $\sin (\alpha + 2\pi k) = \sin \alpha$
- $\operatorname{tg} (\alpha + \pi k) = \operatorname{tg} \alpha$
- $\operatorname{ctg} (\alpha + \pi k) = \operatorname{ctg} \alpha$
- $\sin^2 \alpha + \cos^2 \alpha = 1$

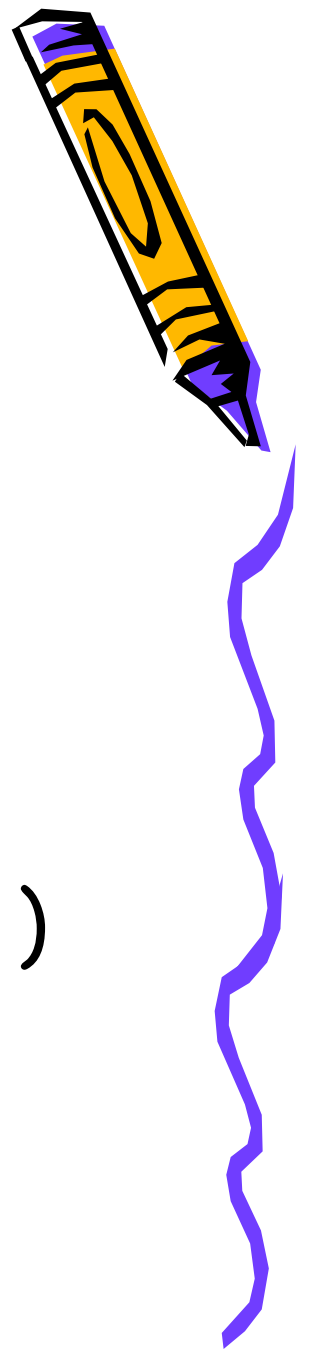




- $\operatorname{tg} \alpha = \cos \alpha / \sin \alpha$, $\alpha \neq \pi n$, $n \in \mathbb{Z}$
- $\operatorname{tg} \alpha \cdot \operatorname{ctg} \alpha = 1$, $\alpha \neq (\pi n)/2$, $n \in \mathbb{Z}$
- $1 + \operatorname{tg}^2 \alpha = 1 / \cos^2 \alpha$, $\alpha \neq \pi (2n+1)/2$
- $1 + \operatorname{ctg}^2 \alpha = 1 / \sin^2 \alpha$, $\alpha \neq \pi n$



Формулы сложения:



- $\sin(x+y) = \sin x \cos y + \cos x \sin y$
- $\sin (x-y) = \sin x \cos y - \cos x \sin y$
- $\cos (x+y) = \cos x \cos y - \sin x \sin y$
- $\cos (x-y) = \cos x \cos y + \sin x \sin y$
- $\text{tg}(x+y) = (\text{tg } x + \text{tg } y) / (1 - \text{tg } x \text{tg } y)$





- $x, y, \quad x + y \neq \pi/2 + \pi n$
- $\operatorname{tg}(x-y) = (\operatorname{tg} x - \operatorname{tg} y) / (1 + \operatorname{tg} x \operatorname{tg} y)$
- $x, y, \quad x - y \neq \pi/2 + \pi n$



Формулы двойного аргумента.



- $\sin 2\alpha = 2\sin \alpha \cos \alpha$

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

- $= 1 - 2 \sin^2 \alpha$

- $\operatorname{tg} 2\alpha = (2 \operatorname{tg} \alpha) / (1 - \operatorname{tg}^2 \alpha)$

- $1 + \cos \alpha = 2 \cos^2 \alpha / 2$

- $1 - \cos \alpha = 2 \sin^2 \alpha / 2$

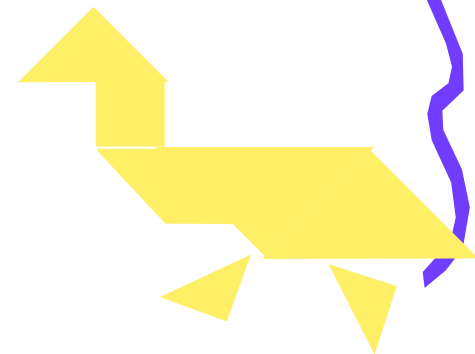
- $\operatorname{tg} \alpha = (2 \operatorname{tg} (\alpha/2)) / (1 - \operatorname{tg}^2 (\alpha/2))$



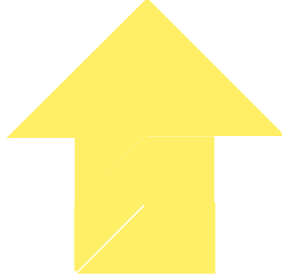
Ф-ЛЫ ПОЛОВИННОГО аргумента.



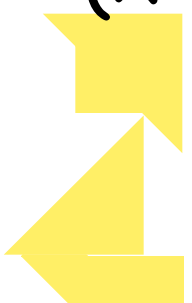
- $\sin^2 \alpha/2 = (1 - \cos \alpha)/2$
- $\cos^2 \alpha/2 = (1 + \cos \alpha)/2$
- $\operatorname{tg} \alpha/2 = \sin \alpha / (1 + \cos \alpha) = (1 - \cos \alpha) / \sin \alpha$
- $\alpha \neq \pi + 2\pi n, n \in \mathbb{Z}$



Ф-лы преобразования суммы в произв.

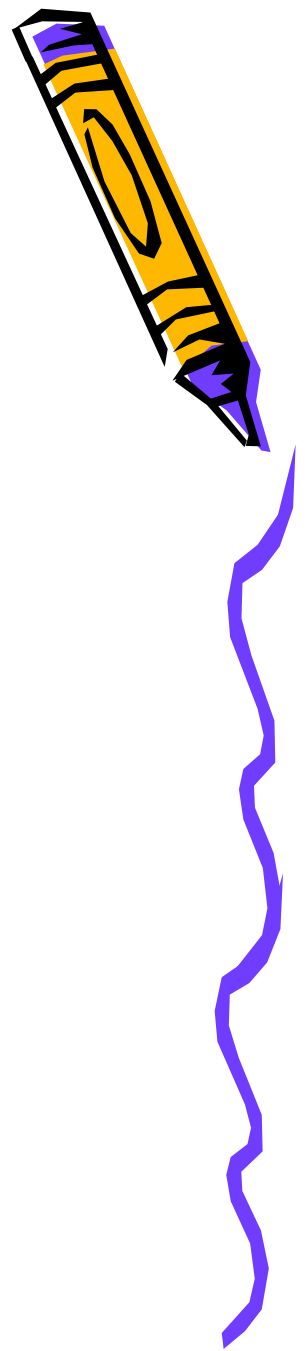


- $\sin x + \sin y = 2 \sin \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right)$
- $\sin x - \sin y = 2 \cos \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right)$
- $\cos x + \cos y = 2 \cos \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right)$
- $\cos x - \cos y = -2 \sin \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right)$



$$\operatorname{tg} x + \operatorname{tg} y = \frac{\sin (x+y)}{\cos x \cos y}$$

$$\operatorname{tg} x - \operatorname{tgy} = \frac{\sin (x - y)}{\cos x \cos y}$$

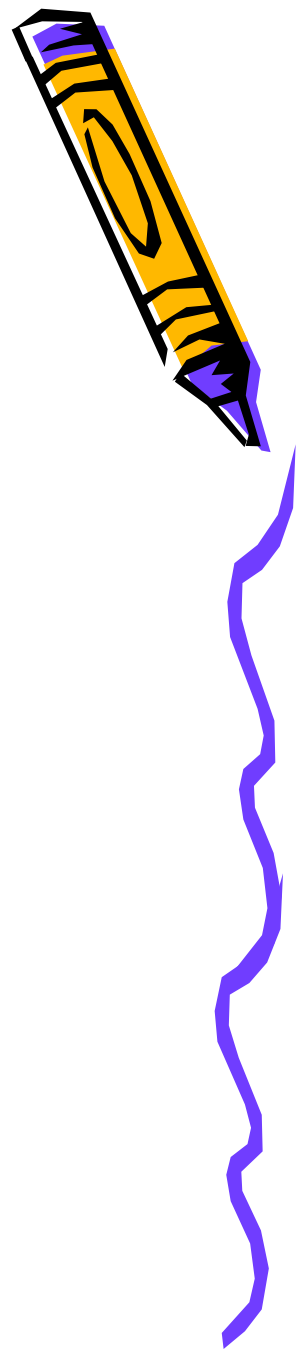


Формулы преобр. произв. в сумму

$$\sin x \sin y = \frac{1}{2}(\cos (x-y) - \cos (x+y))$$

$$\cos x \cos y = \frac{1}{2}(\cos (x-y) + \cos (x+y))$$

$$\sin x \cos y = \frac{1}{2}(\sin (x-y) + \sin (x+y))$$



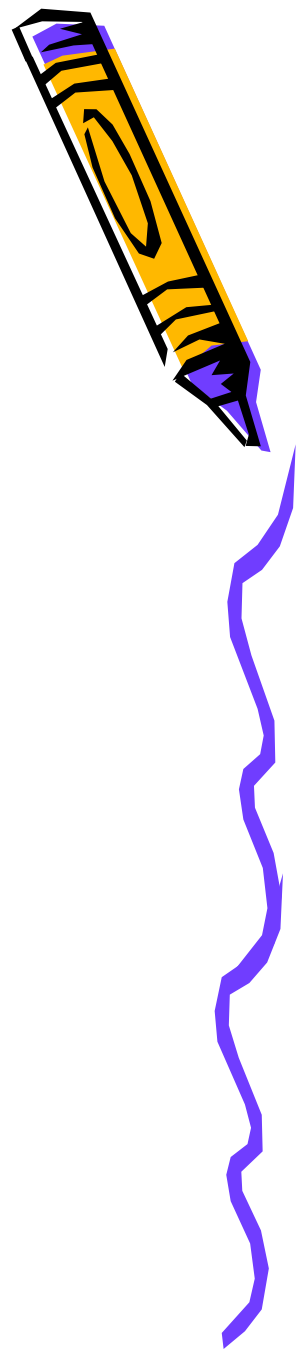
Соотнош. между ф-ями

$$\sin x = \frac{2 \operatorname{tg} x/2}{1 + \operatorname{tg}^2 x/2}$$

$$\frac{1 - \operatorname{tg}^2 x/2}{1 + \operatorname{tg}^2 x/2}$$

$$\cos x = \frac{1 - \operatorname{tg}^2 x/2}{1 + \operatorname{tg}^2 x/2}$$

$$\frac{1 - \operatorname{tg}^2 x/2}{1 + \operatorname{tg}^2 x/2}$$



Тригонометрические уравнения

$$\underline{\sin x = m ; |m| \leq 1}$$

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

$$\sin x = 1$$

$$\sin x = 0$$

$$x = \pi/2 + 2\pi k$$

$$x = \pi k$$

$$\sin x = -1$$

$$x = -\pi/2 + 2\pi k$$

$$\underline{\cos x = m; |m| \leq 1}$$

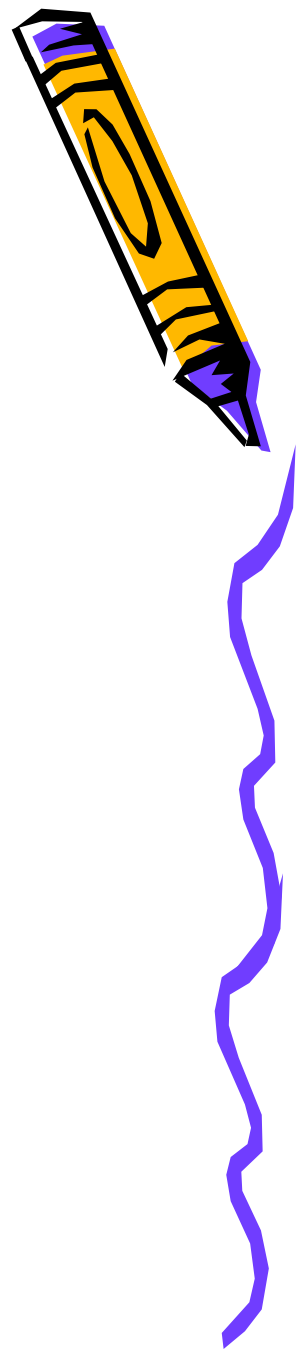
$$\underline{x = \pm \arccos m + 2\pi k}$$

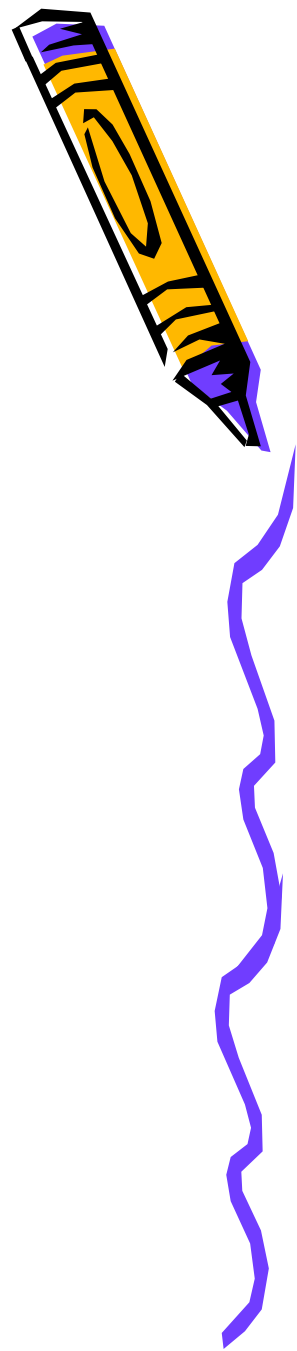
$$\cos x = 1$$

$$\cos x = 0$$

$$x = 2\pi k$$

$$x = \pi/2 + \pi k$$





$$\cos x = -1$$

$$x = \pi + 2\pi k$$

$$\underline{\text{tg } x = m}$$

$$x = \text{arctg } m + \pi k$$

$$\underline{\text{ctg } x = m}$$

$$x = \text{arcctg } m + \pi k$$

$$\sin x/2 = 2t/(1+t^2); t = \text{tg } x/2$$

$$\cos x/2 = (1-t^2)/(1+t^2)$$



