Формулы двойного угла

Формулы двойного угла выражают синус, косинус, тангенс и котангенс угла 2α через тригонометрические функции угла α.

Список формул двойного угла

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

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

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

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

$$tg2\alpha = \frac{2tg\alpha}{1 - tg^2\alpha}$$

$$ctg2\alpha = \frac{ctg^2\alpha - 1}{2ctg\alpha}$$

○ $cos8\alpha =$
$= cos^2 4\alpha - sin^2 4\alpha$

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

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

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

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

$$tg2\alpha = \frac{2tg\alpha}{1 - tg^2\alpha}$$

$$ctg2\alpha = \frac{ctg^2\alpha - 1}{2ctg\alpha}$$

- $sin10\alpha =$
$= 2 \cdot sin5\alpha \cdot cos5\alpha$

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

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

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

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

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

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

ПРИМЕР 3

$tg14\alpha =$

$$= \frac{2 \cdot tg7\alpha}{1 - tg^2 7\alpha}$$

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

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

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

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

$tg 2\alpha = \dfrac{2tg\alpha}{1 - tg^2 \alpha}$

$ctg 2\alpha = \dfrac{ctg^2 \alpha - 1}{2ctg\alpha}$

ПРИМЕР 4

○ $ctg20\alpha =$

$$= \frac{ctg^2 10\alpha - 1}{2 \cdot ctg 10\alpha}$$

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

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

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

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

$tg 2\alpha = \dfrac{2tg\alpha}{1 - tg^2 \alpha}$

$ctg 2\alpha = \dfrac{ctg^2 \alpha - 1}{2ctg\alpha}$

Вычислите:

$$2\sin 15^0 \cos 15^0 = \sin 30^0$$

Ответ: **0,5**

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

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

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

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

$$tg2\alpha = \frac{2tg\alpha}{1 - tg^2\alpha}$$

$$ctg2\alpha = \frac{ctg^2\alpha - 1}{2ctg\alpha}$$

Вычислите:

$cos^2 30°-sin^2 30° =$

$= cos 60°$

Ответ: 0,5

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

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

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

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

$tg 2\alpha = \dfrac{2tg\alpha}{1 - tg^2\alpha}$

$ctg 2\alpha = \dfrac{ctg^2\alpha - 1}{2ctg\alpha}$

Вычислите самостоятельно:

Ответ: $\sqrt{3}/3$

$$\frac{2tg15^0}{1-tg^2 15^0}$$

$$= tg30°$$

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

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

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

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

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

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

САМОСТОЯТЕЛЬНО:

$\cos 12\alpha$

$\text{ctg}88\alpha$

$\sin 70\alpha$

$\text{tg}150\alpha$