

любое триг ур-ие можно свести к ур-ию высших степеней

$$\sin^2 x = \sin^2 x / 1 = \sin^2 x / (\sin^2 x + \cos^2 x) = \operatorname{tg}^2 x / (1 + \operatorname{tg}^2 x)$$

$$\cos^2 x = \cos^2 x / (\cos^2 x + \sin^2 x) = 1 / (1 + \operatorname{tg}^2 x)$$

$$\sin 2x = \sin 2x / 1 = \sin 2x / (\cos^2 x + \sin^2 x) = 2 \sin x \cos x / (\cos^2 x + \sin^2 x) = 2 \operatorname{tg} x / (1 + \operatorname{tg}^2 x)$$

$$\cos 2x = \cos 2x / 1 = (\cos^2 x - \sin^2 x) / (\sin^2 x + \cos^2 x) = (1 - \operatorname{tg}^2 x) / (1 + \operatorname{tg}^2 x)$$

$$\operatorname{tg} 2x = \sin 2x / \cos 2x = 2 \operatorname{tg} x / (1 + \operatorname{tg}^2 x) / (1 - \operatorname{tg}^2 x) / (1 + \operatorname{tg}^2 x) = 2 \operatorname{tg} x / (1 - \operatorname{tg}^2 x)$$

$$\operatorname{tg} 3x = \operatorname{tg}(x + 2x) = (\operatorname{tg} x + \operatorname{tg} 2x) / (1 - \operatorname{tg} x \operatorname{tg} 2x)$$

$$\operatorname{tg}(a+b) = \sin(a+b) / \cos(a+b) = (\sin a \cos b + \sin b \cos a) / (\cos a \cos b - \sin a \sin b) = (\operatorname{tga} + \operatorname{tgb}) / (1 - \operatorname{tga} \operatorname{tgb})$$

проверить отдельно
 $\cos x = 0$

$$3 \operatorname{tg} 3x - \operatorname{ctg} 2x = 4 \operatorname{tg} x$$

$$3(\operatorname{tg} x + \operatorname{tg} 2x) / (1 - \operatorname{tg} x \operatorname{tg} 2x) - (1 - \operatorname{tg}^2 x) / (2 \operatorname{tg} x) = 4 \operatorname{tg} x$$

$$- (1 - \operatorname{tg}^2 x) / (2 \operatorname{tg} x) = 4 \operatorname{tg} x$$

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

$$3(a + 2a / (1 - a^2)) - (1 - a^2) / 2a = 4a$$

$$(3a + 6a / (1 - a^2)) - (1 - a^2) / 2a = 4a$$

$$(3a(1 - a^2 + 2) / (1 - a^2)) - (1 - a^2) / 2a = 4a$$

$$(3a(1 - a^2 + 2) / (1 - a^2)) * (1 - a^2) / (1 - 3a^2) - (1 - a^2) / 2a = 4a$$

$$3a(1 - a^2 + 2) / (1 - 3a^2) - (1 - a^2) / 2a = 4a$$

$$6a^2(1 - a^2 + 2) - (1 - a^2)(1 - 3a^2) = 8a^2(1 - 3a^2)$$

$$18a^2 - 6a^4 - 1 + 4a^2 - 3a^4 = 8a^2 - 24a^4$$

$$15a^4 + 14a^2 - 1 = 0$$

$$t = a^2, a^2 = -1, (1/5)$$

$$a = \pm \sqrt{1/5}$$

$$\operatorname{tg} x = \sqrt{1/5}$$

$$x = \operatorname{arctg}(\sqrt{1/5}) + \pi k$$

$$x = \operatorname{arctg}(-\sqrt{1/5}) + \pi k$$