

выразить всё, что ниже через $\operatorname{tg}x$

$$1.1 \sin^2 x = 1/(1+1/\operatorname{tg}^2 x) = 1/(\operatorname{tg}^2 x/\operatorname{tg}^2 x + 1/\operatorname{tg}^2 x) = 1/((\operatorname{tg}^2 x + 1)/\operatorname{tg}^2 x) = \operatorname{tg}^2 x/(\operatorname{tg}^2 x + 1)$$
$$1 + \operatorname{ctg}^2 x = 1/\sin^2 x$$

$$1.2 \sin^2 x = \sin^2 x / 1 = \sin^2 x / (\sin^2 x + \cos^2 x) = \sin^2 x / \cos^2 x / (\sin^2 x + \cos^2 x) / \cos^2 x = \operatorname{tg}^2 x/(\operatorname{tg}^2 x + 1)$$

$$2.1 \cos^2 x = 1/(1 + \operatorname{tg}^2 x)$$

$$2.2 \cos^2 x = \cos^2 x / 1 = \cos^2 x / (\sin^2 x + \cos^2 x) = \cos^2 x / \cos^2 x / (\sin^2 x + \cos^2 x) / \cos^2 x = 1/(1 + \operatorname{tg}^2 x)$$

$$3.1 \sin 2x = 2\sin x \cdot \cos x = 2\sin x \cdot \cos x / 1 = 2\sin x \cdot \cos x / (\sin^2 x + \cos^2 x) = 2\sin x \cdot \cos x / \cos^2 x / (\sin^2 x + \cos^2 x) / \cos^2 x =$$
$$= 2\sin x / \cos x / (\operatorname{tg}^2 x + 1) = 2\operatorname{tg} x / (\operatorname{tg}^2 x + 1)$$

4.1

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

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

$$4.2 \cos 2x = (\cos^2 x - \sin^2 x) / 1 = (\cos^2 x - \sin^2 x) / (\sin^2 x + \cos^2 x) = (1 - \operatorname{tg}^2 x) / (\operatorname{tg}^2 x + 1)$$

$$5.2 \operatorname{tg} 2x = 2\operatorname{tg} x / (1 + \operatorname{tg}^2 x) = (2\operatorname{tg} x / (1 + \operatorname{tg}^2 x)) / ((1 - \operatorname{tg}^2 x) / (\operatorname{tg}^2 x + 1)) = (2\operatorname{tg} x / (1 + \operatorname{tg}^2 x)) / ((1 - \operatorname{tg}^2 x) / (\operatorname{tg}^2 x + 1)) = 2\operatorname{tg} x / (1 - \operatorname{tg}^2 x)$$

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