Question: Simplify

$$\cos x * \csc x / \cot^2 x.$$

Solution. To simplify the expression, let us recall the definition of *cosecant* and *cotangent* functions:

$$\csc x = \frac{1}{\sin x},$$
$$\cot x = \frac{\cos x}{\sin x}.$$

We now substitute these functions with the expressions on the right, step by step.

First, replace $\cot x$ in the denominator with the appropriate formula:

$$\frac{\cos x * \csc x}{\cot^2 x} = \frac{\cos x * \csc x}{\frac{\cos^2 x}{\sin^2 x}} = \frac{\cos x * \csc x * \sin^2 x}{\cos^2 x} = \frac{\csc x * \sin^2 x}{\cos x}.$$

We will now utilize the definition of $\csc x$:

$$\frac{\csc x * \sin^2 x}{\cos x} = \frac{\frac{1}{\sin x} * \sin^2 x}{\cos x} = \frac{\sin x}{\cos x} = \tan x.$$

Answer.

$$\frac{\cos x * \csc x}{\cot^2 x} = \tan x.$$