Task:

Verify the identities.
$sin^4 x - cos^4 x = 2sin^2 x - 1.$

Solution:

Let's transform the left part of the expression:

We use the relationship $x^2 - y^2 = (x + y)(x - y)$ [difference between two squares]:

$$sin^4 x - cos^4 x = (sin^2 x + cos^2 x)(sin^2 x - cos^2 x) =$$

Using the basic relationship between the sine and the cosine $sin^2 x + cos^2 x = 1$, we get:

$$= (1) \cdot (sin^2 x - cos^2 x) = sin^2 x - cos^2 x = sin^2 x - cos^2 x + 1 - 1$$

We add and subtract 1(one):

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

Using the basic relationship between the sine and the cosine, we have:

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

And simplified:

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

And this is the same as the right part of the expression.

Solution: expressions are identical.