SATPREP Name_____

Double angle trigonometric Identity

Date_____

Verify each identity.

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

2) $\cos^2 x + \tan^2 x\sin^2 x = \sec^2 x\sin^2 x + \cos 2x$

3) $\dfrac{2\sin^2 x}{\tan x} = \sin 2x$

4) $1 + \cos 2x - \tan 4x\cos 4x = 2\cos^2 x - \sin 4x$

5) $\dfrac{\tan x}{\sin 2x} = \dfrac{\sec^2 x}{2}$

6) $\csc^2 x\tan x = \dfrac{2}{\sin 2x}$

7) $\dfrac{1 + \tan^2 x}{\tan^2 x} = \dfrac{2}{1 - \cos 2x}$

8) $\tan^2 x(1 + \cos 2x) = \dfrac{2}{\csc^2 x}$

9) $\dfrac{\tan x}{1 - \cos 2x} = \dfrac{1}{\sin 2x}$

10) $3\cos^2 x = \cos 2x + 2 - \sin^2 x$

Answers to Double angle trigonometric Identity

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

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

$2\sin^2 x - 1 + \sin 2x$ ■

2) $\cos^2 x + \tan^2 x\sin^2 x$ Use $\cos 2x = \cos^2 x - \sin^2 x$

$\sin^2 x\tan^2 x + \sin^2 x + \cos 2x$ Use $\tan^2 x + 1 = \sec^2 x$

$\sec^2 x\sin^2 x + \cos 2x$ ■

3) $\dfrac{2\sin^2 x}{\tan x}$ Use $\tan x = \dfrac{\sin x}{\cos x}$

$\dfrac{2\sin^2 x\cos x}{\sin x}$ Cancel common factors

$2\cos x\sin x$ Use $\sin 2x = 2\sin x\cos x$

$\sin 2x$ ■

4) $1 + \cos 2x - \tan 4x\cos 4x$ Use $\cos 2x = 2\cos^2 x - 1$

$2\cos^2 x - \tan 4x\cos 4x$ Decompose into sine and cosine

$2\cos^2 x - \dfrac{\sin 4x}{\cos 4x} \cdot \cos 4x$ Simplify

$2\cos^2 x - \sin 4x$ ■

5) $\dfrac{\tan x}{\sin 2x}$ Use $\sin 2x = 2\sin x\cos x$

$\dfrac{\tan x}{2\sin x\cos x}$ Use $\tan x = \dfrac{\sin x}{\cos x}$

$\dfrac{\sin x}{2\cos^2 x\sin x}$ Cancel common factors

$\dfrac{1}{2\cos^2 x}$ Use $\sec x = \dfrac{1}{\cos x}$

$\dfrac{\sec^2 x}{2}$ ■

6) $\csc^2 x\tan x$ Decompose into sine and cosine

$\left(\dfrac{1}{\sin x}\right)^2 \cdot \dfrac{\sin x}{\cos x}$ Simplify

$\dfrac{1}{\sin x\cos x}$ Create a common factor

$\dfrac{2}{2\sin x\cos x}$ Use $\sin 2x = 2\sin x\cos x$

$\dfrac{2}{\sin 2x}$ ■

7) $\dfrac{1+\tan^2 x}{\tan^2 x}$ Use $\tan^2 x + 1 = \sec^2 x$

$\dfrac{\sec^2 x}{\tan^2 x}$ Decompose into sine and cosine

$\dfrac{\left(\dfrac{1}{\cos x}\right)^2}{\left(\dfrac{\sin x}{\cos x}\right)^2}$ Simplify

$\dfrac{1}{\sin^2 x}$ Use $\sin^2 x = \dfrac{1-\cos 2x}{2}$

$\dfrac{2}{1-\cos 2x}$ ■

8) $\tan^2 x(1+\cos 2x)$ Use $\tan^2 x = \dfrac{1-\cos 2x}{1+\cos 2x}$

$\dfrac{(1+\cos 2x)(1-\cos 2x)}{1+\cos 2x}$ Cancel common factors

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

$2\sin^2 x$ Use $\csc x = \dfrac{1}{\sin x}$

$\dfrac{2}{\csc^2 x}$ ■

9) $\dfrac{\tan x}{1-\cos 2x}$ Use $\cos 2x = 1 - 2\sin^2 x$

$\dfrac{\tan x}{2\sin^2 x}$ Use $\tan x = \dfrac{\sin x}{\cos x}$

$\dfrac{\sin x}{2\cos x \sin^2 x}$ Cancel common factors

$\dfrac{1}{2\sin x \cos x}$ Use $\sin 2x = 2\sin x \cos x$

$\dfrac{1}{\sin 2x}$ ■

10) $3\cos^2 x$ Use $\cos^2 x = \dfrac{1+\cos 2x}{2}$

$\dfrac{3(1+\cos 2x)}{2}$ Use $\cos 2x = 1 - 2\sin^2 x$

$\dfrac{6(1-\sin^2 x)}{2}$ Cancel common factors

$3(1-\sin^2 x)$ Use $\cos 2x = 1 - 2\sin^2 x$

$\cos 2x + 2 - \sin^2 x$ ■