 Name_____

Multiple-Angle Identities

Date_____ Period____

Use the half-angle identities to find the exact value of each.

1) sin 292.5°

2) sin 337.5°

3) tan 105°

4) cos 105°

5) cos 157.5°

6) cos 337.5°

Find the exact value of each.

7) $\tan\theta = \frac{15}{8}$ where $180 \le \theta < 270$

Find $\tan 2\theta$

8) $\cos\theta = -\frac{2\sqrt{14}}{9}$ where $90 \le \theta < 180$

Find $\sin 2\theta$

9) $\tan\theta = \frac{\sqrt{2}}{4}$ where $0 \le \theta < 90$

Find $\cos\frac{\theta}{2}$

10) $\tan\theta = \frac{\sqrt{3}}{3}$ where $0 \le \theta < 90$

Find $\cos 2\theta$

11) $\cos\theta = \frac{3}{5}$ where $270 \le \theta < 360$

Find $\cos 2\theta$

12) $\tan\theta = \frac{4}{3}$ where $180 \le \theta < 270$

Find $\tan\frac{\theta}{2}$

Verify each identity.

13) $\dfrac{\sin 2x}{\cos x} = 2\sin x$

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

15) $\dfrac{2\sin x\cos x}{\csc^2 x - 1} = \tan^2 x\sin 2x$

16) $\dfrac{\sin 2x}{\cot^2 x(1 + \cos 2x)} = \tan^3 x$

 Name_____

Multiple-Angle Identities

Date_____ Period____

Use the half-angle identities to find the exact value of each.

1) sin 292.5°

$-\frac{\sqrt{2+\sqrt{2}}}{2}$

2) sin 337.5°

$-\frac{\sqrt{2-\sqrt{2}}}{2}$

3) tan 105°

$-2-\sqrt{3}$

4) cos 105°

$-\frac{\sqrt{2-\sqrt{3}}}{2}$

5) cos 157.5°

$-\frac{\sqrt{2+\sqrt{2}}}{2}$

6) cos 337.5°

$\frac{\sqrt{2+\sqrt{2}}}{2}$

Find the exact value of each.

7) $\tan\theta=\frac{15}{8}$ where $180\le\theta<270$

Find $\tan 2\theta$

$-\frac{240}{161}$

8) $\cos\theta=-\frac{2\sqrt{14}}{9}$ where $90\le\theta<180$

Find $\sin 2\theta$

$-\frac{20\sqrt{14}}{81}$

9) $\tan\theta=\frac{\sqrt{2}}{4}$ where $0\le\theta<90$

Find $\cos\frac{\theta}{2}$

$\frac{\sqrt{18+12\sqrt{2}}}{6}$

10) $\tan\theta=\frac{\sqrt{3}}{3}$ where $0\le\theta<90$

Find $\cos 2\theta$

$\frac{1}{2}$

11) $\cos\theta=\frac{3}{5}$ where $270\le\theta<360$

Find $\cos 2\theta$

$-\frac{7}{25}$

12) $\tan\theta=\frac{4}{3}$ where $180\le\theta<270$

Find $\tan\frac{\theta}{2}$

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Verify each identity.

13) $\dfrac{\sin 2x}{\cos x} = 2\sin x$

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

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

$2\sin x$ ■

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

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

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

$\tan 2x$ ■

15) $\dfrac{2\sin x\cos x}{\csc^2 x - 1} = \tan^2 x\sin 2x$

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

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

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

$\tan^2 x\sin 2x$ ■

16) $\dfrac{\sin 2x}{\cot^2 x(1 + \cos 2x)} = \tan^3 x$

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

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

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

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

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

$\tan^3 x$ ■