

Name _____ Date _____ Period _____

Worksheet 6.4—Other Identities

Show all work. No Calculator permitted.

Multiple Choice

1. If $f(x) = \sin x$ and $g(x) = \cos x$, then $f(2x) =$
(A) $2f(x)$ (B) $f(2)f(x)$ (C) $f(x)g(x)$ (D) $2f(x)g(x)$ (E) $f(2)g(x) + g(2)f(x)$
2. $\sin 22.5^\circ =$
(A) $\frac{\sqrt{2}}{4}$ (B) $\frac{\sqrt{3}}{4}$ (C) $\frac{\sqrt{6} - \sqrt{2}}{4}$ (D) $\sqrt{\frac{2 - \sqrt{2}}{2}}$ (E) $\frac{\sqrt{2 - \sqrt{2}}}{2}$
3. How many numbers between 0 and 2π satisfy the equation $\sin 2x = \cos x$?
(A) none (B) one (C) two (D) three (E) fourrrr

4. What is the period of the function $f(x) = 3\sin^2 x - 3\cos^2 x$?

- (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) π (D) 2π (E) 4π

5. Solve $2\cos x + \sin 2x = 0$ on the interval $0 \leq x < 2\pi$.

- (A) $\frac{\pi}{2}, \frac{3\pi}{2}$ (B) $0, \pi, \frac{3\pi}{2}$ (C) $0, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{\pi}{2}$ (D) $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$ (E) No solution

6. Rewrite the following expression in terms of $\sin x$ and $\cos x$: $\sin 2x - \cos 3x$

- (A) $2\sin^2 x \cos x - \cos^3 x - 2\sin x \cos x$ (B) $\cos^3 x + 2\sin^2 x \cos x - \sin^2 x + 2\sin x \cos x$
(C) $2\sin x \cos x - \cos x + 4\cos x \sin^2 x$ (D) $3\sin^2 x \cos x - \sin^3 x + 2\sin x \cos x$ (E) $-\cos x$

7. Solve $\cos^2\left(\frac{x}{2}\right) = \cos^2 x$ on the interval $0 \leq x < 2\pi$.

- (A) No solution (B) $\frac{\pi}{6}, \pi, \frac{11\pi}{6}$ (C) $0, \frac{2\pi}{3}$ (D) $0, \frac{\pi}{6}$ (E) $0, \frac{2\pi}{3}, \frac{4\pi}{3}$

Short Answer

8. Solve the following equations in the interval $x \in [0, 2\pi)$.

(a) $\sin 3x = 1$

(b) $\sin 2x - \tan x = 0$

(c) $\ln 1 - \cos x = \cos 2x$

(d) $\cos 2x + \cos 4x = 0$

(e) $\cos^2 x = \sin^2\left(\frac{x}{2}\right)$

(f) $\cos^2\left(\frac{1}{2}x\right) = 1 - \sin^2 x$

9. Find the exact value of the following:

(a) $\cos \frac{3\pi}{8}$

(b) $\tan 22.5^\circ$

10. Find $\sin 2x$, $\cos 2x$, and $\tan 2x$ from the given information.

(a) $\sin x = \frac{5}{13}$, $\sec x > 0$

(b) $\cot x = \frac{2}{3}$, $\sin x > 0$

11. Find $\sin\left(\frac{x}{2}\right)$, $\cos\left(\frac{x}{2}\right)$, and $\tan\left(\frac{x}{2}\right)$ from the given information.

- (a) $\cos x = -\frac{4}{5}$, $\csc x < 0$ (b) $\sec x = \frac{3}{2}$, $\tan x < 0$ (c) $\csc x = 3$, $\cos x < 0$ (this is a fun one!)

12. Prove the following identities.

- (a) $\sin 4x = 2 \sin 2x \cos 2x$ (b) $\cos 6x = 2 \cos^2 3x - 1$ (c) $\sin 3x = \sin x (4 \cos^2 x - 1)$

$$(d) \cos 4x = 1 - 8 \sin^2 x \cos^2 x$$

$$(e) \sin^4 x = \frac{1}{8}(3 - 4 \cos 2x + \cos 4x)$$

$$(f) \sin^3 2x = \left(\frac{\sin(-2x)}{2} \right) (\cos(-4x) - 1)$$