

Find the exact values for $\sin 2x$, $\cos 2x$, and $\tan 2x$ under the given conditions:

1. $\sin x = -\frac{4}{5}$ and $\frac{3\pi}{2} < x < 2\pi$

2. $\sec x = -5$ and $\pi < x < \frac{3\pi}{2}$

For each equation, find:

a) the general solution b) the particular values for $0 \leq x < 2\pi$ or $0 \leq \theta < 360^\circ$

3. $4\sin x \cos x = \sqrt{3}$

4. $4\sin x \cos x = -\sqrt{2}$

5. $\cos^2 \theta - \sin^2 \theta = -1$

6. $1 - 2\sin^2 x = -\frac{1}{2}$

7. $\frac{2\tan x}{1 - \tan^2 x} = \sqrt{3}$

8. $\frac{2\tan \theta}{1 - \tan^2 \theta} = -1$

Using the double angle properties, write an equation expressing:

9. $\tan 18x$ in terms of $\tan 9x$

10. $\cot 14x$ in terms of $\tan 7x$

11. $\cos 10x$ in terms of $\cos 5x$ and $\sin 5x$

12. $\sin 6x$ in terms of $\cos 3x$ and $\sin 3x$

13. $\cos 6x$ in terms of $\cos 3x$

14. $\cos 22x$ in terms of $\sin 11x$

Simplify each expression using the double angle properties:

15. $\frac{\sin 2x}{2 \sin x}$

16. $2 \cos 2y \bullet \sin 2y$

17. $1 - 2 \sin^2 3k$

18.
$$\frac{2 \tan\left(\frac{1}{2}x\right)}{1 - \tan^2\left(\frac{1}{2}x\right)}$$

Prove each identity (Pick any 5):

19. $\frac{\cos 2x}{\cos x - \sin x} = \cos x + \sin x$

21. $\tan x = \frac{1 - \cos 2x}{\sin 2x}$

22. $\cos 2x = \frac{1 - \tan^2 x}{1 + \tan^2 x}$

23. $\sin 2x = 2 \cot x \bullet \sin^2 x$

24. $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$

25. $\frac{\sin 2x}{1 + \cos 2x} = \tan x$

26. $\frac{1}{2}(1 + \cos 2x) = \cos^2 x$

27. $(1 + \tan x) \tan 2x = \frac{2 \tan x}{1 - \tan x}$

28. $\cos^4 x - \sin^4 x = \cos 2x$

29. $\sec 2x = \frac{1}{1 - 2 \sin^2 x}$

30. $\frac{1 + \cos 2x}{\sin 2x} = \cot x$