Pre AP Pre Calculus Name:_____

5.1 Double Angle Properties Date: _____ Period : ___

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 $0 \le x < 2\pi$ or $0 \le \theta < 360^o$

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

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Prove each identity (Pick any 5):

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

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

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

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

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

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

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

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

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

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

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

5.2 Half Angle Properties

Name: _____

Find the exact value of $\sin\frac{1}{2}x$, $\cos\frac{1}{2}x$, and $\tan\frac{1}{2}x$ under the given conditions:

1. $\cos x = \frac{3}{5}$ and $0 < x < \frac{\pi}{2}$

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

Using the half angle properties, prove the following on the back or on a separate sheet of paper:

3. $\tan\frac{1}{2}x + \cot\frac{1}{2}x = 2\csc x$

4. $\tan x \tan\frac{1}{2}x = \sec x - 1$

5. $\dfrac{2\tan\frac{1}{2}x}{1+\tan^2\frac{1}{2}x} = \sin x$

6. $\tan\frac{1}{2}x(2\cot x + \tan\frac{1}{2}x) = 1$

7. $\tan\frac{1}{2}x = \csc x - \cot x$

8. $\dfrac{\cos\frac{1}{2}x - \sin\frac{1}{2}x}{\cos\frac{1}{2}x + \sin\frac{1}{2}x} = \dfrac{\cos x}{1+\sin x}$

9. $\dfrac{\cos\frac{1}{2}x + \sin\frac{1}{2}x}{\cos\frac{1}{2}x - \sin\frac{1}{2}x} = \sec x + \tan x$

10. $\tan(\frac{\pi}{4} + \frac{x}{2}) = \sec x + \tan x$

5.3 Solving Trig Equations Part 1 Name: _____

Solve each equation on the indicated domain, show all of your work!

1. $\tan\theta + \sqrt{3} = 0$ $\theta \in \left[0^o, 360^o\right)$

2. $2\cos x + \sqrt{3} = 0$ $x \in \left[0, 2\pi\right)$

3. $2\sin\left(\theta + 82^o\right) = -1$ $\theta \in \left[0^o, 360^o\right)$

4. $\sec\left(\theta + 74^o\right) = -2$ $\theta \in \left[0^o, 360^o\right)$

5. $4\cos^2 x = 1$ $x \in \left[0, 2\pi\right)$

6. $4\sin^2 x = 3$ $x \in \left\{\text{real numbers}\right\}$

7. $\tan x - \sqrt{3} = 2\tan x \qquad x \in \{\text{real numbers}\}$

8. $\cos x + 2 = 3\cos x \quad x \in \{\text{real numbers}\}$

9. $\sin^2 x + 3\cos^2 x = 0 \quad x \in [0, 2\pi)$

10. $\sin 2x \cos x - \cos 2x \sin x = -\dfrac{\sqrt{3}}{2} \qquad x \in [0, 2\pi)$

11. $\sin 2x \sin x + \cos x = 0 \qquad x \in [0, 2\pi)$

12. $\cos 4x \cos x - \sin 4x \sin x = 0 \quad x \in [0, 2\pi)$

5.4 Solving Trig Equations (with factoring) Name: _____

Solve each equation on the indicated domain, show all of your work!

1. $2\sin\theta\cos\theta = \sqrt{2}\cos\theta \qquad \theta \in \{\text{real number degrees}\}$

2. $\tan x \sec x = \tan x \qquad x \in \{\text{real numbers}\}$

3. $2\sin^2 x + \sin x = 0 \qquad x \in (-\pi, \pi)$

4. $2\cos^2 x - 5\cos x + 2 = 0 \qquad x \in [0, 2\pi)$

5. $2\sec^2 x - 3\sec x - 2 = 0 \qquad x \in [0, 2\pi)$

6. $\sin^2 x + 5\sin x + 6 = 0 \qquad x \in [0, 2\pi)$

7. $\tan^2 x - \sec x - 1 = 0 \qquad x \in [-\pi, \pi)$

8. $\tan^2 x + \tan x = 0 \qquad x \in (-\pi, \pi)$

9. $4\csc^2 x + 4\csc x + 1 = 0 \qquad x \in [0, 2\pi)$

10. $3 - 3\sin x - 2\cos^2 x = 0 \qquad x \in [-\pi, \pi]$

11. $\sin 2x + \sqrt{3}\sin x = 0 \qquad x \in [0, 2\pi)$

12. $4\sin^2 x + 7\sin x = 2 \qquad x \in [0, 2\pi)$

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5.5 Mixed Solving Equations Worksheet

Solve each equation on the indicated domain, show all of your work on a separate paper.

1. $4\cos^2\theta + 4\cos\theta = -1$ $\quad \theta \in \left[0^o, 360^o\right)$

2. $\sin x \cos x = -\frac{1}{2}$ $\quad x \in [0, 2\pi)$

3. $2\sin^2 x - 5\sin x + 2 = 0$ $\quad x \in [0, 2\pi)$

4. $\cos^2 x - \sin^2 x = 0$ $\quad x \in [0, 2\pi)$

5. $4\sin^2\theta - 3 = 0$ $\quad \theta \in \left[0^o, 360^o\right)$

6. $\cos 2x = 2 - 2\sin^2 x$ $\quad x \in [0, 2\pi)$

7. $\cos 4x \cos x + \sin 4x \sin x = -1$ $\quad x \in [0, 2\pi)$

8. $\dfrac{\sin\left(\frac{\pi}{2} - x\right)}{\sin x} = -\sqrt{3}$ $\quad x \in \left(-\frac{3\pi}{2}, \frac{3\pi}{3}\right)$

9. $\tan\left(90^o - \theta\right) = -\frac{\sqrt{3}}{3}$ $\quad \theta \in \left(-180^o, 180^o\right)$

10. $\sin 2\theta \cos 58^o + \cos 2\theta \sin 58^o = \frac{\sqrt{3}}{2}$

$\theta \in \left[0^o, 360^o\right)$

11. $\cos 3\theta \cos 12^o - \sin 3\theta \sin 12^o = \frac{1}{2}$

$\theta \in \left(-180^o, 180^o\right)$

12. $\sin 2x = \cos x$ $\quad x \in [0, 2\pi)$

13. $\tan 2\left(\theta + 41^o\right) = 1$ $\quad \theta \in \left[0^o, 360^o\right)$

14. $\sin\theta \cos 37^o = \cos\theta \sin 37^o$ $\quad \theta \in \left[0^o, 360^o\right)$

15. $\cos 2x - \sin x = 1$ $\quad x \in [0, 2\pi)$

16. $\sin 2x + \cos x = 0$ $\quad x \in [0, 2\pi)$

17. $4\sin x \cos x = -\sqrt{3}$ $\quad x \in (-\pi, \pi)$

18. $\cos 2x + \sin^2 x = 0$ $\quad x \in [0, 2\pi)$

19. $2\cos^2 x - 2\cos 2x = 1$ $\quad x \in [0, 2\pi)$

20. $\sin 2x - \cos x = 0$ $\quad x \in [0, 2\pi)$

21. $\cos 2x + \cos x = 0$ $\quad x \in [0, 2\pi)$

22. $\left(\sin x - \cos x\right)^2 = 1$ $\quad x \in [0, 2\pi)$

23. $\sin x \cos x + \frac{1}{2} = 0$ $\quad x \in [0, 2\pi)$