HPC 3/7/17

- Answers for sum & difference problems
- Complete Notes for Solving Trig Equations

Sum & Difference Answers

1. $\frac{\sqrt{2}-\sqrt{6}}{4}$ 2. $\frac{\sqrt{6}-\sqrt{2}}{4}$ 3. $\frac{\sqrt{6}-\sqrt{2}}{4}$ 4. $\frac{-\sqrt{2}-\sqrt{6}}{4}$ 5. $\frac{\sqrt{6}-\sqrt{2}}{4}$ 6. $\frac{-\sqrt{2}-\sqrt{6}}{4}$

7. $\frac{\sqrt{3}+1}{1-\sqrt{3}}$ 8. $\frac{\sqrt{3}-1}{1+\sqrt{3}}$ 9. $\frac{1-\sqrt{3}}{1+\sqrt{3}}$ 10. $\sin 30 = \frac{1}{2}$ 11. $\cos 60 = \frac{1}{2}$

12. $\tan 45 = 1$ 13. $\sin\frac{\pi}{6} = \frac{1}{2}$ 14. $\tan\frac{\pi}{6} = \frac{\sqrt{3}}{3}$

Solving "Basic" Trigonometric Equations Students will be able to solve trigonometric equations.	Precalculus/Honors Precalculus

What steps are needed to solve Trig equations?

Use Algebra techniques to isolate the Trig function:

- Add/Subtract/Multiply/Divide both sides
  - By NUMBERS; NOT trig functions
- Factor
- Use the quadratic formula
  - $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Square root both sides
- ETC.

Then: Use an inverse trig function ($\sin^{-1}$; $\cos^{-1}$; $\tan^{-1}$) to solve for the angle(s)

(Or recognize values of trig functions from the Unit Circle)

- Often times there are many angles that are solutions ☺

Example 1:

Solve $2sinx = 1$ for all angle values of x on the interval $[0, 2\pi)$

$\frac{2\sin x}{2} = \frac{1}{2} \rightarrow \sin x = \frac{1}{2} \quad x = \frac{\pi}{6}, \frac{5\pi}{6}$

Example 2:

Solve $cos2x + \sqrt{3} = -cos2x$ for all angle values of x on the interval $[0, 2\pi)$

$\cos 2x + \sqrt{3} = -\cos 2x$

$+\cos 2x \qquad\qquad +\cos 2x$

$2\cos 2x + \sqrt{3} = 0$

$\qquad -\sqrt{3} \quad -\sqrt{3}$

$\frac{2\cos 2x}{2} = \frac{-\sqrt{3}}{2} \qquad \cos 2x = -\frac{\sqrt{3}}{2}$

$2x = \frac{5\pi}{6}, \frac{7\pi}{6}$

$\frac{\;}{\frac{2}{1}} \quad \frac{\;}{\frac{2}{1}}$

$x = \frac{5\pi}{12}, \frac{7\pi}{12}$

Solving "Basic" Trigonometric Equations

Students will be able to solve trigonometric equations.

Honors Precalculus

Example 3: Solve $3cot^2x - 1 = 0$ for all values of x

$3\cot^2 x - 1 = 0$

$+1 \quad +1$

$\frac{3\cot^2 x}{3} = \frac{1}{3}$

$\sqrt{\cot^2 x} = \frac{\sqrt{1}}{\sqrt{3}}$

$\cot x = \pm\frac{1}{\sqrt{3}}$

$\tan x = \pm\frac{\sqrt{3}}{1} \begin{matrix}\leftarrow y \\ \leftarrow x\end{matrix}$

$\left(\pm\frac{1}{2}, \pm\frac{\sqrt{3}}{2}\right)$

$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

$2\pi \cdot n$

$2n \cdot \pi$

$2x^2 - x - 1 = 0$

$(2x+1)(x-1) = 0$

Example 4:

Solve $2sin^2x - sinx - 1 = 0$ for all values of x

$(2\sin x + 1)(\sin x - 1) = 0$

$2\sin x + 1 = 0 \qquad \sin x - 1 = 0$

$\sin x = -\frac{1}{2} \qquad \sin x = 1$

$x = \left\{\frac{7\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}\right\} + 2n\pi$

Solving "Basic" Trigonometric Equations

Students will be able to solve trigonometric equations.

Honors Precalculus

Example 5:

Solve $\sqrt{2}\csc x + 2 = 4$ for all values of x

$-2 \quad -2$

$\frac{\sqrt{2}\csc x}{\sqrt{2}} = \frac{2}{\sqrt{2}}$

$\csc x = \frac{2}{\sqrt{2}}$

$\sin x = \frac{\sqrt{2}}{2}$

$x = \left\{\frac{\pi}{4}, \frac{3\pi}{4}\right\} + 2n\pi$

Example 6:

Solve $\sqrt{\sec^2 x} = \sqrt{\frac{4}{3}}$ for all values of x

$\sec x = \pm\frac{2}{\sqrt{3}}$

$\cos x = \pm\frac{\sqrt{3}}{2}$

$x = \left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}\right\} + 2n\pi$

Solving "simple" trigonometric equations: Practice Name________________________________

Solve the following equations for *x* over the interval $[0, 2\pi)$.

1. $2\cos x + 4 = 5$
2. $2\sin x - 1 = 0$
3. $\tan^2 x - 3 = 0$
4. $5\cos x - \sqrt{3} = 3\cos x$
5. $4\csc^2 x - 2 = 0$
6. $4\sin^2 x - 2 = 0$

Solve the following equations for all angle values of *x*.

7. $3\tan x - 3 = 0$
8. $\sec\left(\frac{3x}{2}\right) + 2 = 0$
9. $\sin^2 x - 4\sin x - 5 = 0$
10. $5\cos 2x + 1 = 3\cos 2x$
11. $16\cos^2 x - 8 = 0$
12. $2\cos^2 x - 3\cos x + 1 = 0$

Solving Trigonometric Equations Name:_______________________ Period:______

Using Trig Identities

Solve for x over the interval [0, 2π).

1. $2\cos^2 x + 3\sin x = 0$

2. $2\cos^2 x - \sin x - 1 = 0$

3. $\sin^2 x - 2\cos x - 2 = 0$

4. $4\sin^2 x + 4\cos x - 5 = 0$

5. $\csc^2 x - 2\cot x = 0$

6. $2\tan^2 x - 3\sec x + 3 = 0$

7. $\sin^2 x - \tan x \cos^2 x = 0$

8. $4\cos^2 x = 5 - 4\sin x$

9. $\tan^4 x - 2 = \tan^2 x + \sec^2 x$

10. $\cos x - \cot x = 0$

11. $\cos^2 x - \tan x \cos^2 x = 0$

12. $\sqrt{3}\tan x \sec x + 2\tan x = 0$

1. $\cos 105^\circ = \cos(60^\circ + 45^\circ)$

$u = 60^\circ$

$v = 45^\circ$

$= \cos 60^\circ \cos 45^\circ - \sin 60^\circ \sin 45^\circ$

$\left(\frac{1}{2} \cdot \frac{\sqrt{2}}{2}\right) - \left(\frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2}\right)$

9. $\tan 165^\circ = \tan(120^\circ + 45^\circ)$

$= \dfrac{\tan 120 + \tan 45}{1 - \tan 120 \cdot \tan 45} = \dfrac{-\sqrt{3} + 1}{1 - (-\sqrt{3} \cdot 1)}$

$= \dfrac{-\sqrt{3} + 1}{1 + \sqrt{3}} = \dfrac{1 - \sqrt{3}}{1 + \sqrt{3}}$

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14. $$\frac{\tan\frac{\pi}{5} - \tan\frac{\pi}{30}}{1 + \tan\frac{\pi}{5}\cdot\tan\frac{\pi}{30}} = \tan\left(\frac{\pi}{5} - \frac{\pi}{30}\right) = \tan\frac{\pi}{6} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}} \rightarrow \frac{\sqrt{3}}{3}$$

$$\frac{\cancel{\pi}}{5}\cdot\frac{\cancel{180}^{36^\circ}}{\cancel{\pi}}$$

$$\frac{\pi}{5}\left(\frac{6}{6}\right) = \frac{6\pi}{30} - \frac{\pi}{30} = \frac{5\pi}{30} = \frac{\pi}{6}$$

$$\frac{\pi}{30}$$

10. $\sin 25^\circ \cos 5^\circ + \cos 25 \sin 5^\circ = \sin(25^\circ + 5)$

$= \sin 30^\circ = \frac{1}{2}$

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13. $\sin\frac{5\pi}{12}\cos\frac{\pi}{4} - \cos\frac{5\pi}{12}\sin\frac{\pi}{4} = \sin\frac{\pi}{6} = \frac{1}{2}$

$\sin\left(\frac{5\pi}{12} - \frac{\pi}{4}\cdot\frac{3}{3}\right)$

$\frac{5\pi}{12} - \frac{3\pi}{12} = \frac{2\pi}{12} = \frac{\pi}{6}$