## Cheatography

## Solving Trigonometric Proofs Cheat Sheet

## Solving Trigonometric Proofs

## Method 1

Pick one side of the equation (usually the most complicated side) and work with that side until it is equal to the other side

## Method 2

Work with both sides simultaneously until they are both equal to the same expression.

## Helpful Techniques

## Rewrite

Rewrite the expression in terms of sine and cosine only

## Multiply by One

Multiply the numerator and denominator of a rational expression by a carefully chosen "one"

## Combine fractions

Write sums and differences of rational expressions as a single fraction

## Factor

Factor trigonometric expressions, using "u-substitution" as needed

## Pythagorean Theorem

Look for combinations or portions of Pythagorean Identities.
Remember that you can multiply, divide, add or subtract the identity to get a new version.

## Goal

Always keep the goal in mind. As you manipulate one side of the equation, keep the other side in mind. Look for commonalities

## Verifying Trigonometric Identities

Video: http://youtu.be/Rf05H8ogHLg

## Pythagorean Identities

$$
\begin{gathered}
\sin ^{2} x+\cos ^{2} x=1 \\
\sin ^{2} x=1-\cos ^{2} x \\
\cos ^{2} x=1-\sin ^{2} x \\
1+\cot ^{2} x=\csc ^{2} x \\
\cot ^{2} x=\csc ^{2} x-1 \\
\tan ^{2} x+1=\sec ^{2} x \\
\tan ^{2} x=\sec ^{2} x-1
\end{gathered}
$$

Divide original Pythagorean identity by $\sin ^{2} \mathrm{x}$ or $\cos ^{2} \mathrm{x}$ to get other identities, subtract to get even more.
Basic Trigonometric Functions

| $\sin (-x)=-\sin (x)$ | $\tan (x)=\sin (x) / \cos (x)$ | $\csc (x)=1 / \sin (x)$ |
| :--- | :--- | :--- |
| $\cos (-x)=\cos (x)$ | $\cot (x)=\cos (x) / \sin (x)$ | $\sec (x)=1 / \cos (x)$ |
| $\tan (-x)=-\tan (x)$ |  | $\cot (x)=1 / \tan (x)$ |

Complementary Angle Identities

| $\sin (\mathrm{pi} / 2-\mathrm{x})=\cos (\mathrm{x})$ |
| :--- |
| $\cos (\mathrm{pi} / 2-\mathrm{x})=\sin (\mathrm{x})$ |
| $\tan (\mathrm{pi} / 2-\mathrm{x})=\cot (\mathrm{x})$ |

## Sum and Difference Identities

| $\sin (a+/-b)=$ | $\sin (a) \cos (b)+/-\cos (a) \sin (b)$ |
| :--- | :--- |
| $\cos (a+/-b)=$ | $\cos (a) \cos (b)-/+\sin (a) \sin (b)$ |

Use $\sin (a+/-b) / \cos (a+/-b)$ to find $\tan (a+/-b)$

| Double Angle Identities |  |
| :--- | :--- |
| $\sin (2 x)$ | $\cos (2 x)$ |
| $2 \sin (x) \cos (x)$ | $\cos ^{2}(x)-\sin ^{2}(x)$ |
|  | $1-2 \sin ^{2}(x)$ |
|  | $2 \cos ^{2}(x)-1$ |



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Page 1 of 1 .

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