Identities: ~~Multiplication~~ $2x+x=3x$

- Reciprocal

$\sin x = \frac{1}{\csc x}$ $\quad \csc x = \frac{1}{\sin x}$

$\cos x = \frac{1}{\sec x}$ $\quad \sec x = \frac{1}{\cos x}$

$\tan x = \frac{1}{\cot x}$ $\quad \cot x = \frac{1}{\tan x}$

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- Quotient

$\tan x = \frac{\sin x}{\cos x}$

$\cot x = \frac{\cos x}{\sin x}$

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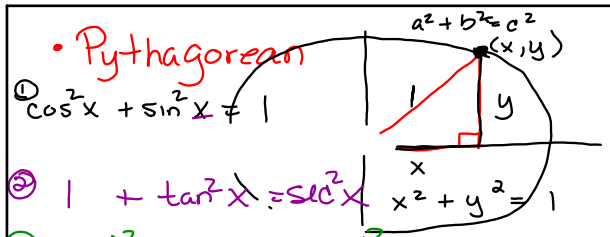
- Pythagorean



① $\cos^2 x + \sin^2 x = 1$

② $1 + \tan^2 x = \sec^2 x$

③ $\cot^2 x + 1 = \csc^2 x$

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Ex. Solve: (using ids)

① If $\cot x = 2$ $\quad \tan x = \frac{1}{2}$

② $\sin x = \frac{1}{2}$ $\quad \cos x =$

$\rightarrow \cos^2 x + \sin^2 x = 1$

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

$\cos^2 x + \frac{1}{4} = 1$

$\sqrt{\cos^2 x} = \sqrt{\frac{3}{4}}$

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

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③ $\cot x = .8$ $\quad \csc x =$

$\cot^2 x + 1 = \csc^2 x$

$(.8)^2 + 1 = \csc^2 x$

$.64 + 1 = \csc^2 x$

$\sqrt{1.64} = \sqrt{\csc^2 x}$

$\pm 1.28 = \csc x$

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④ $\tan\theta = \frac{\sqrt{3}}{2}$ $\quad \sec\theta$

⑤ $\sin\theta = \frac{40}{41}$ $\quad \tan\theta$

$\rightarrow \cot^2\theta + 1 = \csc^2 x$

$\cot^2\theta + 1 = \left(\frac{41}{40}\right)^2$

$\cot^2\theta + 1 = \frac{1681}{1600} - \frac{1600}{1600}$

$\sqrt{\cot^2\theta} = \sqrt{\frac{81}{1600}}$

$\cot\theta = \frac{9}{40}$

$\tan\theta = \frac{40}{9}$

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(b) $\cos\theta = \frac{3}{5}$ $\tan\theta$

$1 + \tan^2\theta = \sec^2\theta$

$1 + \tan^2\theta = \left(\frac{5}{3}\right)^2$

$1 + \tan^2\theta = \frac{25}{9} - \frac{9}{9}$

$\sqrt{\tan^2\theta} = \sqrt{\frac{16}{9}}$

$\tan\theta = 4/3$

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- Simplify
  - look for a pyth. id
  - rewrite in terms of sin/cos

(1) $\frac{\tan x \csc x}{\sec x} = \frac{\frac{\sin x}{\cos x} \cdot \frac{1}{\sin x}}{\frac{1}{\cos x}}$

$= \frac{\frac{1}{\cos x}}{\frac{1}{\cos x}} = 1$

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(2) $\cos x \tan x \csc x$

$\cos x \cdot \frac{\sin x}{\cos x} \cdot \frac{1}{\sin x} = 1$

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(3) $\frac{\csc\beta}{(1 + \cot^2\beta)} = \frac{\csc\beta}{\csc^2\beta}$

$= \frac{1}{\csc\beta} = \sin\beta$

$\frac{\csc\beta}{\csc\beta \cdot \csc\beta}$

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(4) $\frac{(\sin^2 x + \cos^2 x)}{\sec^2 x}$

$\frac{1}{\sec^2 x}$

$\cos^2 x$

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