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Case I $\quad x \le -8$

$7 - x + 3x - 6 - 4x - 32 - x = 21$

$$\boxed{x = -\frac{52}{3}}$$ ✓

II $\quad -8 \le x \le 0$

$7 - x + 3x - 6 + 4x + 32 - x = 21$

$5x = -12$

$$\boxed{x = -\frac{12}{5}}$$ ✓

$3x$

III $\quad x \in [0, 2]$

$7 - x + 3x - 6 + 4x + 32 + x = 21$

$7x = -12$ ✗

IV $\quad 2 \le x \le 7$

$7 - x - 3x + 6 + 4x + 32 + x = 21$

$x = -24$ ✗

V $\quad x \ge 7$

$x - 7 - 3x + 6 + 4x + 32 + x = 21$

$x = -\frac{10}{3}$ ✗

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2.

$x \geq -2$

$\dfrac{x+2-x}{x} < 2$

$\dfrac{2}{x} - 2 < 0$

$\dfrac{2(1-x)}{x} < 0$

$\dfrac{x-1}{x} > 0$

$x \in (-\infty, 0) \cup (1, \infty)$

$\boxed{x \in [-2, 0) \cup (1, \infty)}$

OR

$\boxed{x < -2}$

$\dfrac{-x-2-x}{x} < 2$

$\dfrac{2+2x}{x} + 2 > 0$

$\dfrac{2(1+2x)}{x} > 0$

$x \in \left(-\infty, -\frac{1}{2}\right) \cup (0, \infty)$

$\boxed{x \in (-\infty, -2)}$

$\boxed{x \in (-\infty, 0) \cup (1, \infty)}$

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3. $x \geq 0$ OR $x < 0$ ✓

$$\frac{x^2-7x+10}{x^2-6x+9} < 0$$

$$\frac{(x+2)(x+5)}{(x-3)^2} = \frac{x^2+7x+10}{(x-3)^2} < 0$$

$$\frac{(x-5)(x-2)}{(x-3)^2} < 0$$

+ − + +

−5 −2 3

$\boxed{x \in (2,3) \cup (3,5)}$ ✓ $x \in (-5,-2)$

+ − − +

2 3 5

4. $\boxed{(-7,-4) \cup (-4,1)}$

$\boxed{x \in (-5,-2) \cup (2,3) \cup (3,5)}$

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7. $x \geq 3$ OR $x < 3$ ✓

$$\frac{x-3}{(x-3)(x-2)} \geq 2$$

$$\frac{1}{x-2} - 2 \geq 0 \qquad x \neq 3$$

$$\frac{1-2x+4}{x-2} \geq 0$$

$$\frac{2x-5}{x-2} \leq 0$$

$(2, 5/2]$

ϕ

$$\boxed{x \in \left[\frac{3}{2}, 2\right)}$$

$$\frac{3-x}{(x-3)(x-2)} \geq 2$$

$$2 + \frac{1}{x-2} \leq 0 \qquad x \neq 3$$

$$\frac{2x-3}{x-2} \leq 0$$

$$\left[\frac{3}{2}, 2\right)$$

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6: $x \geq 1$

$\frac{x-1}{x+2} - 1 < 0$

$\frac{-3}{x+2} > 0$

$(-2, \infty)$

$\boxed{x \in [1, \infty)}$

$x < 1$ ✓

$1 + \frac{x-1}{x+2} > 0$

$\frac{2x+1}{x+2} > 0$

$(-\infty, -2) \cup (-\frac{1}{2}, \infty)$

$\boxed{x \in (-\infty, -2) \cup (-\frac{1}{2}, 1)}$

$\boxed{x \in (-\infty, -2) \cup (-\frac{1}{2}, \infty)}$

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5.

$$\frac{x^2-5x+6}{|x|+7} < 0$$

$|x|+7 > 0$

S. L. Loney

Trigonometry

$$(x-2)(x-3) < 0$$

$$\boxed{x \in (2,3)}$$

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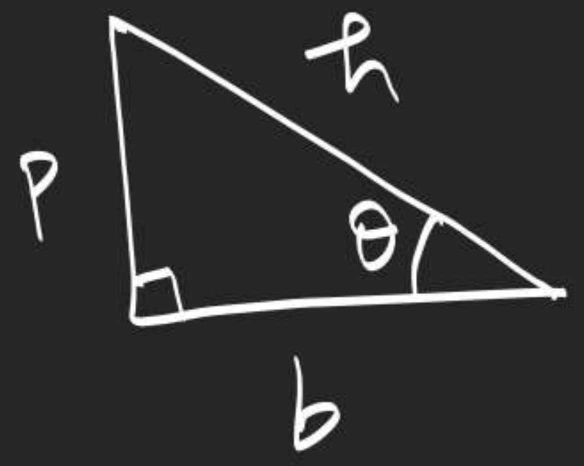
Trigonometry → measurement.

Tri → 3 sides

gone → sides



$\sin\theta = \frac{p}{h}$ $\qquad$ $\operatorname{cosec}\theta = \frac{h}{p}$

$\cos\theta = \frac{b}{h}$ $\qquad$ $\sec\theta = \frac{h}{b}$

$\tan\theta = \frac{p}{b}$ $\qquad$ $\cot\theta = \frac{b}{p}$

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Identity

Equation which holds true for all values of parameters wherever defined.

$x = x \rightarrow$ Identity

$a^2+b^2=c^2$

not identity

$x^2-3x+2=(x-1)(x-2) \rightarrow$ Identity

$(a+b)^2=a^2+b^2+2ab \rightarrow$ Identity

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$$\boxed{\begin{aligned} \sin^2\theta + \cos^2\theta &= 1 \\ \sec^2\theta - \tan^2\theta &= 1 \\ \operatorname{cosec}^2\theta - \cot^2\theta &= 1 \end{aligned}}$$

P. T.

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1. P.T. $(\sec\theta + \operatorname{cosec}\theta)(\sin\theta + \cos\theta) = \sec\theta\operatorname{cosec}\theta + 2$

$$\left(\frac{1}{\cos\theta} + \frac{1}{\sin\theta}\right)(\sin\theta + \cos\theta) = \frac{(\sin\theta + \cos\theta)^2}{\sin\theta\cos\theta}$$

$$= \frac{(\sin^2\theta + \cos^2\theta) + 2\sin\theta\cos\theta}{\sin\theta\cos\theta} = \frac{1 + 2\sin\theta\cos\theta}{\sin\theta\cos\theta} = \sec\theta\operatorname{cosec}\theta + 2$$

2. $(\sec^2\theta + \tan^2\theta)(\operatorname{cosec}^2\theta + \cot^2\theta) = 1 + 2\sec^2\theta\operatorname{cosec}^2\theta$

$$\frac{(1 + \sin^2\theta)}{\cos^2\theta}\,\frac{(1 + \cos^2\theta)}{\sin^2\theta} = \frac{(1 + \sin^2\theta + \cos^2\theta) + \sin^2\theta\cos^2\theta}{\sin^2\theta\cos^2\theta}$$

$$= \frac{2 + \sin^2\theta\cos^2\theta}{\sin^2\theta\cos^2\theta} = 2\operatorname{cosec}^2\theta\sec^2\theta + 1$$

3. $\tan^2\theta\sin^2\theta = \tan^2\theta - \sin^2\theta$

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$$\boxed{\begin{aligned} \tan^2\theta \sin^2\theta &= \tan^2\theta - \sin^2\theta \\ \cot^2\theta \cos^2\theta &= \cot^2\theta - \cos^2\theta \end{aligned}}$$

$\tan^2\theta \sin^2\theta$

$= \tan^2\theta(1-\cos^2\theta)$

$= \tan^2\theta - \sin^2\theta$

$\cot^2\theta - \cos^2\theta = \cot^2\theta(1-\sin^2\theta)$

$= \cot^2\theta \cos^2\theta$

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4.
$$\frac{\cot\theta+\operatorname{cosec}\theta-1}{\cot\theta-\operatorname{cosec}\theta+1}=\cot\theta+\operatorname{cosec}\theta$$

$(\operatorname{cosec}\theta-\cot\theta)(\operatorname{cosec}\theta+\cot\theta)$

$$\frac{\cot\theta+\operatorname{cosec}\theta-(\operatorname{cosec}^2\theta-\cot^2\theta)}{\cot\theta-\operatorname{cosec}\theta+1}=\frac{(\operatorname{cosec}\theta+\cot\theta)(1-\cancel{(\operatorname{cosec}\theta-\cot\theta)})}{\cancel{\cot\theta-\operatorname{cosec}\theta+1}}$$

$$=\operatorname{cosec}\theta+\cot\theta$$

5.
$$\left(\frac{1+\sin\alpha}{1+\cos\alpha}\right)\left(\frac{1+\sec\alpha}{1+\operatorname{cosec}\alpha}\right)=\tan\alpha$$

$$\left(\frac{1+\sin\alpha}{1+\cos\alpha}\right)\left(\frac{1+\frac{1}{\cos\alpha}}{1+\frac{1}{\sin\alpha}}\right)=\cancel{\left(\frac{1+\sin\alpha}{1+\cos\alpha}\right)}\cancel{\left(\frac{1+\cos\alpha}{1+\sin\alpha}\right)}\frac{\sin\alpha}{\cos\alpha}=\tan\alpha$$

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1. P.T. $\frac{\sin x + \cos x}{\cos^3 x} = \tan^3 x + \tan^2 x + \tan x + 1$

$\frac{\sin x}{\cos x} \frac{1}{\cos^2 x} + \frac{1}{\cos^2 x} = \tan x \sec^2 x + \sec^2 x$

$= \tan x (1 + \tan^2 x) + 1 + \tan^2 x$

$= \tan^3 x + \tan x + \tan^2 x + 1$

2. Simplify

$\operatorname{cosec}^2 A \cot^2 A - \sec^2 A \tan^2 A - (\cot^2 A - \tan^2 A)$
$(\sec^2 A \operatorname{cosec}^2 A - 1)$

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P.T.

3. $$\frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A} = 2\,\mathrm{cosec}\,A$$

4. $$\cos^6 A + \sin^6 A = 1 - 3\sin^2 A \cos^2 A$$

5. $$\sin^8 A - \cos^8 A = \left(\sin^2 A - \cos^2 A\right)\left(1 - 2\sin^2 A \cos^2 A\right)$$

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2: $\operatorname{cosec}^2 A \cot^2 A - \sec^2 A \tan^2 A - (\cot^2 A - \tan^2 A)(\sec^2 A \operatorname{cosec}^2 A - 1)$

$$\frac{\cos^2 A}{\sin^4 A} - \frac{\sin^2 A}{\cos^4 A} - \frac{(\cos^4 A - \sin^4 A)}{\sin^2 A \cos^2 A}\,\frac{(1 - \sin^2 A \cos^2 A)}{\sin^2 A \cos^2 A}$$

$$= \frac{\cos^6 A - \sin^6 A - (\cos^4 A - \sin^4 A)(1 - \sin^2 A \cos^2 A)}{\sin^4 A \cos^4 A}$$

$$\frac{\cos^6 A - \sin^6 A - (\cos^2 A - \sin^2 A)(1 - \sin^2 A \cos^2 A)}{\sin^4 A \cos^4 A}$$

$(\sin^2 A + \cos^2 A)^2$

$$\frac{(\cos^6 A - \sin^6 A) - (\cos^2 A - \sin^2 A)(\sin^4 A + \cos^4 A + \sin^2 A \cos^2 A)}{\sin^4 A \cos^4 A}$$

$$\frac{\cancel{\cos^6 A - \sin^6 A} - (\cos^6 A - \sin^6 A)}{\sin^4 A \cos^4 A} = 0$$

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Ineq:

sec 1.5

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