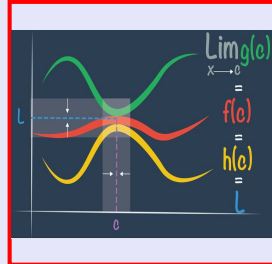


Math 261

Fall 2023

Lecture 4



Feb 19-8:47 AM

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

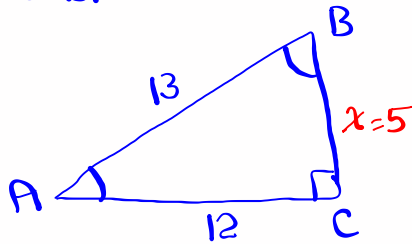
$\sin A = \frac{\text{opposite}}{\text{Hypotenuse}}$ $\sin A = \frac{a}{c}$ $\csc A = \frac{c}{a}$
 $\cos A = \frac{\text{adjacent}}{\text{Hypotenuse}}$ $\cos A = \frac{b}{c}$ $\sec A = \frac{c}{b}$
 $\tan A = \frac{\text{opposite}}{\text{Adjacent}}$ $\tan A = \frac{a}{b}$ $\cot A = \frac{b}{a}$

$3^2 + 4^2 = 5^2 \checkmark$
 $9 + 16 = 25 \checkmark$

$\sin A = \frac{3}{5}$ $\csc A = \frac{5}{3}$
 $\cos A = \frac{4}{5}$ $\sec A = \frac{5}{4}$
 $\tan A = \frac{3}{4}$ $\cot A = \frac{4}{3}$

Aug 31-10:30 AM

Consider the triangle below:



1) find the missing leg.

$$x^2 + 12^2 = 13^2$$

$$x^2 + 144 = 169 \quad \rightarrow \quad x^2 = 25$$

$$\boxed{x = 5}$$

2) Find

$$\sin B = \frac{12}{13}$$

$$\csc B = \frac{13}{12}$$

$$\cos B = \frac{5}{13}$$

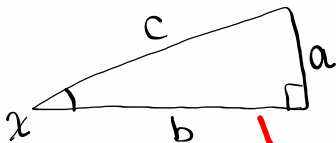
$$\sec B = \frac{13}{5}$$

$$\tan B = \frac{12}{5}$$

$$\cot B = \frac{5}{12}$$

Aug 31-10:37 AM

Prove $\sin^2 x + \cos^2 x = 1$ ✓



$$\sin x = \frac{a}{c}$$

$$\cos x = \frac{b}{c}$$

$$\left(\frac{a}{c}\right)^2 + \left(\frac{b}{c}\right)^2 =$$

$$\frac{a^2}{c^2} + \frac{b^2}{c^2} =$$

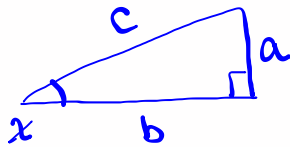
$$\frac{a^2 + b^2}{c^2} = \frac{c^2}{c^2} = \boxed{1} \checkmark$$

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

by Pythagorean Thm

Aug 31-10:44 AM

Prove $1 + \tan^2 x = \sec^2 x$ ✓



$$\tan x = \frac{a}{b}$$

$$1 = \frac{b^2}{b^2}$$

$$\cos x = \frac{b}{c}, \quad \sec x = \frac{c}{b}$$

$$1 + \left(\frac{a}{b}\right)^2 =$$

$$1 + \frac{a^2}{b^2} = \frac{b^2}{b^2} + \frac{a^2}{b^2}$$

$$= \frac{a^2 + b^2}{b^2} = \frac{c^2}{b^2} = \left(\frac{c}{b}\right)^2$$

$$= \boxed{\sec^2 x}$$

Aug 31-10:47 AM

Simplify $(\sin x + \cos x)^2 + (\sin x - \cos x)^2 - 2 \tan x \cdot \cot x$

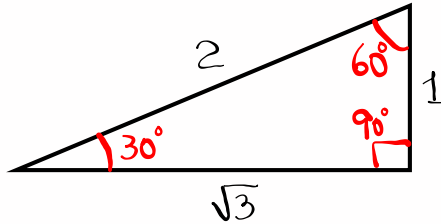
$$= \sin^2 x + \cancel{2\sin x \cos x} + \cos^2 x + \sin^2 x - \cancel{2\sin x \cos x} + \cos^2 x - 2 \cdot 1$$

$$= 1 + 1 - 2 = \boxed{0}$$

Do not use $\emptyset$
for Zero.

Aug 31-10:52 AM

30°-60°-90° Right Triangle.



Verify the Pythagorean theorem

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

$$1^2 + (\sqrt{3})^2 = 2^2$$

$$1 + 3 = 4$$

$$4 = 4 \checkmark$$

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

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

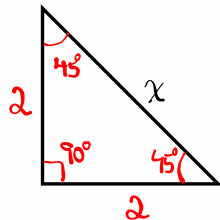
$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \frac{1}{2}$$

$$\tan 60^\circ = \frac{\sqrt{3}}{1} = \sqrt{3}$$

Aug 31-10:58 AM

45°-45°-90° right triangle



1) Find its hypotenuse

$$2^2 + 2^2 = x^2$$

$$4 + 4 = x^2$$

$$x^2 = 8$$

$$x = \sqrt{8} = \sqrt{4 \cdot 2} = 2\sqrt{2}$$

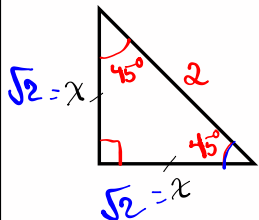
a) Find each leg.

$$x^2 + x^2 = 2^2$$

$$2x^2 = 4$$

$$x^2 = 2$$

$$x = \sqrt{2}$$



$$\sin 45^\circ = \frac{\sqrt{2}}{2}$$

$$\cos 45^\circ = \frac{\sqrt{2}}{2}$$

$$\tan 45^\circ = \frac{\sqrt{2}}{\sqrt{2}} = 1$$

Aug 31-11:05 AM

$$180^\circ = \pi \text{ Radians}$$

find 30° , 45° , 60° , and 90° in radians.

$$30^\circ = \frac{180^\circ}{6} = \frac{\pi}{6}$$

$$30^\circ = \frac{\pi}{6}$$

$$45^\circ = \frac{180^\circ}{4} = \frac{\pi}{4}$$

$$45^\circ = \frac{\pi}{4}$$

$$60^\circ = \frac{180^\circ}{3} = \frac{\pi}{3}$$

$$60^\circ = \frac{\pi}{3}$$

$$90^\circ = \frac{180^\circ}{2} = \frac{\pi}{2}$$

$$90^\circ = \frac{\pi}{2}$$

Aug 31-11:13 AM

Class QZ 3

Simplify $\frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h}$, evaluate your final answer with $h=0$.

$$= \frac{x^2 \cdot 1 - (x+h)^2 \cdot 1}{x^2(x+h)^2 \cdot h}$$

LCM: $x^2(x+h)^2$

Box Your Final Ans

$$= \frac{x^2 - (x+h)^2}{x^2(x+h)^2 \cdot h} = \frac{x^2 - x^2 - 2xh - h^2}{x^2(x+h)^2 \cdot h} = \frac{-2xh - h^2}{x^2(x+h)^2 \cdot h}$$

for $h=0$

$$= \frac{\cancel{h}(-2x - h)}{x^2(x+h)^2 \cdot \cancel{h}} = \frac{-2x - h}{x^2(x+h)^2} = \frac{-2x - 0}{x^2(x+0)^2} = \frac{-2x}{x^2 \cdot x^2} = \boxed{\frac{-2}{x^3}}$$

Aug 31-11:18 AM