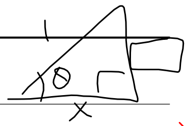
Example #6 **Write the trigonometric expression as an algebraic expression:**
$\cos(\arctan 1 + \arccos x)$

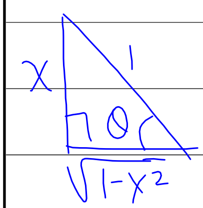
$x^2 + b^2 = 1^2$
$x^2 + b^2 = 1$
$b^2 = 1 - x^2$
$b = \sqrt{1-x^2}$



$\cos(\arctan 1 + \arccos x)$
$= \cos(\arctan 1)\cos(\arccos x) - \sin(\arctan 1)\sin(\arccos x)$
$= \cos\left(\frac{\pi}{4}\right) \quad x \quad - \sin\frac{\pi}{4}$
$\left(\frac{\sqrt{2}}{2}\right)(x) - \left(\frac{\sqrt{2}}{2}\right)\left(\sqrt{1-x^2}\right)$
$\frac{x\sqrt{2}}{2} - \frac{\sqrt{2-2x^2}}{2} = \frac{x\sqrt{2} - \sqrt{2-2x^2}}{2}$

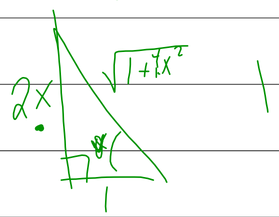
Example #7 **Write the trigonometric expression as an algebraic expression:**
$\cos(\arcsin x - \arctan 2x)$

$\cos(u-v) = \cos u \cos v + \sin u \sin v$
$= \cos(\arcsin x)\cos(\arctan 2x) + \sin(\arcsin x)\sin(\arctan 2x)$
$\sqrt{1-x^2} \quad \left(\frac{1}{\sqrt{1+4x^2}}\right) \quad x \quad \left(\frac{2x}{\sqrt{1+4x^2}}\right)$



$\frac{\sqrt{1-x^2}}{\sqrt{1+4x^2}} + \frac{2x^2}{\sqrt{1+4x^2}}$

$\frac{\sqrt{1-x^2} + 2x^2}{\sqrt{1+4x^2}}$



ex. $\sin(\sin^{-1}4x + \cos^{-1}x)$

$4x^2 + \sqrt{1 - 17x^2 + 16x^4}$

Example #8 **Verify:** $\sin\left(\frac{\pi}{2} + x\right) = \cos x$

$\sin\frac{\pi}{2}\cos x + \cos\frac{\pi}{2}\sin x =$

$1(\cos x) + 0(\sin x) =$

$\cos x + 0 =$

$\cos x = \cos x$ ✓

Example #9 **Verify:** $\boxed{\cos(x+\pi)}\boxed{\cos(x-\pi)} = \cos^2 x$

$(\cos x\cos\pi - \sin x\sin\pi)(\cos x\cos\pi + \sin x\sin\pi) =$

$\cos^2 x\cos^2\pi - \sin^2 x\sin^2\pi =$

$\cos^2 x(-1)^2 - \sin^2 x(0)^2$

$\cos^2 x - \cancel{\sin^2 x(0)} =$

$\cos^2 x = \cos^2 x$ ✓

Example #10 **Simplify:** $\cos\left(x - \frac{3\pi}{2}\right) = -\sin x$

Example #11 **Simplify:** $\tan(x+3\pi)$

$$\frac{\tan x + \tan 3\pi}{1 - \tan x \tan 3\pi}$$

$$\frac{\tan x + 0}{1 - \tan x(0)} = \frac{\quad}{1-0} = \tan x$$

Example #12 **Find all solutions on the interval $[0, 2\pi)$.**

$$\sin\left(x+\frac{\pi}{3}\right)+\sin\left(x-\frac{\pi}{3}\right)=1$$

$$\sin x\cos\frac{\pi}{3} + \cancel{\cos x\sin\frac{\pi}{3}} + \sin x\cos\frac{\pi}{3} - \cancel{\cos x\sin\frac{\pi}{3}} = 1$$

$$2\sin x\cos\frac{\pi}{3} = 1$$

$$2\sin x(1/2) = 1$$

$$\sin x = 1$$

$$x = \frac{\pi}{2}$$

Example #13 **Find all solutions on the interval $[0, 2\pi)$.**

$$\tan(x+\pi)+2\sin(x+\pi)=0$$

$$\frac{\tan x+\tan\pi}{1-\tan x\tan\pi}+2(\sin x\overset{(-1)}{\cos\pi}+\cos x\overset{(0)}{\sin\pi})=0$$

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

$$\tan x-2\sin x=0$$

$$\frac{\sin x}{\cos x}-2\sin x=0$$

$$\sin x\left(\frac{1}{\cos x}-2\right)=0$$

$$\sin x=0 \qquad \sec x-2=0 \qquad \cos x=1/2$$

$$\sec x=2$$

$$x=\left\{0,\pi,\frac{\pi}{3},\frac{5\pi}{3}\right\}$$