Inverse Trig - 9/30/16

1 Inverse Trig

Definition 1.0.1 $\sin^{-1}(x) = y \iff \sin(y) = x$ *where* $-\pi/2 \leq y \leq \pi/2$.

Example 1.0.2 $\sin^{-1}(\sqrt{2}/2) = \pi/4$
$\sin^{-1}(1/2) = \pi/6$
$\arcsin(1) = \pi/2$
$\sin^{-1}(\sin(x)) = x$
$\sin(\arcsin(x)) = x$

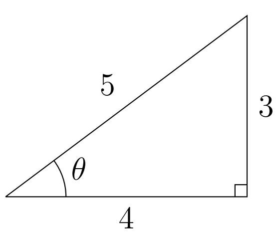
Definition 1.0.3 $\cos^{-1}(x) = y \iff \cos(y) = x$ *where* $0 \leq y \leq \pi$.

Example 1.0.4 $\cos^{-1}(\sqrt{2}/2) = \pi/4$
$\cos^{-1}(1/2) = \pi/3$
$\arccos(1) = 0$
$\cos^{-1}(\cos(x)) = x$
$\cos(\arccos(x)) = x$

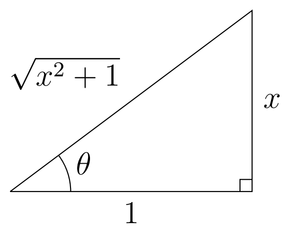
Definition 1.0.5 $\tan^{-1}(x) = y \iff \tan(y) = x$ *where* $-\pi/2 < y < \pi/2$.

2 Examples

Example 2.0.6 $\cos(\tan^{-1}(3/4)) =?$ *First let's draw the triangle: we pick an angle and call it* θ. *Then* $\tan(\theta) = 3/4$, *so I label the side opposite as 3 and the side adjacent to* θ *as 4. Then use the Pythagorean theorem to solve for the length of the last side. Now the problem is really asking me for the* cos *of this angle* θ. *But that's just* $4/5$.



Example 2.0.7 $\cos(\tan^{-1}(x))$. *Let's draw the triangle. We pick an angle and call it* θ. *Then* $\tan(\theta) = x$, *so I label the side opposite as* x *and the side adjacent to* θ *as 1. Let's solve for the hypotenuse. By the Pythagorean Theorem, it will be* $\sqrt{x^2+1}$. *Then* cos *is adjacent over hypotenuse, so this gives us* $\frac{1}{\sqrt{x^2+1}}$.



Example 2.0.8 $\tan(\sin^{-1}(x))$. *Let's draw the triangle. I know that x is opposite and 1 is the hypotenuse, so let's solve for the adjacent side. By the Pythagorean Theorem, it will be $\sqrt{1-x^2}$. Then* tan *is opposite over adjacent, so this gives us* $\frac{x}{\sqrt{1-x^2}}$.