

### 3.6: Derivatives of Inverse Trigonometric Functions

Function	Restricted Domain	Inverse Trig Function	Domain	Range
$y = \sin(x)$	$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$	$y = \sin^{-1}(x) = \arcsin(x)$	$-1 \leq x \leq 1$	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$
<b>Relationships</b>				
$y = \sin^{-1}(x) \Leftrightarrow \sin(y) = x \text{ and } -\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$				
$\sin(\sin^{-1}(x)) = x \text{ for } -1 \leq x \leq 1 \quad \sin^{-1}(\sin(x)) = x \text{ for } -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$				
<b>Derivative</b>				
$\frac{d}{dx}(\sin^{-1}(x)) = \frac{1}{\sqrt{1-x^2}} \text{ for } -1 \leq x \leq 1$				

Function	Restricted Domain	Inverse Trig Function	Domain	Range
$y = \cos(x)$	$0 \leq x \leq \pi$	$y = \cos^{-1}(x) = \arccos(x)$	$-1 \leq x \leq 1$	$0 \leq y \leq \pi$
<b>Relationships</b>				
$y = \cos^{-1}(x) \Leftrightarrow \cos(y) = x \text{ and } 0 \leq y \leq \pi$				
$\cos(\cos^{-1}(x)) = x \text{ for } -1 \leq x \leq 1 \quad \cos^{-1}(\cos(x)) = x \text{ for } 0 \leq x \leq \pi$				
<b>Derivative</b>				
$\frac{d}{dx}(\cos^{-1}(x)) = -\frac{1}{\sqrt{1-x^2}} \text{ for } -1 \leq x \leq 1$				

Function	Restricted Domain	Inverse Trig Function	Domain	Range
$y = \tan(x)$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$	$y = \tan^{-1}(x) = \arctan(x)$	$R$	$-\frac{\pi}{2} < y < \frac{\pi}{2}$
<b>Relationships</b>				
$y = \tan^{-1}(x) \Leftrightarrow \tan(y) = x \text{ and } y \in R$				
$\tan(\tan^{-1}(x)) = x \text{ for } x \in R \quad \tan^{-1}(\tan(x)) = x \text{ for } -\frac{\pi}{2} < x < \frac{\pi}{2}$				
<b>Derivative</b>				
$\frac{d}{dx}(\tan^{-1}(x)) = \frac{1}{1+x^2} \text{ for } x \in R$				