

## Answer on Question #52640 – Math – Trigonometry

what is the actual value of ,  $\arctan [(-1)/(1)]$  ,  $\arctan [(1)/(-1)]$  . do they have different value? then why ? both looks like  $\arctan [-1]$  which is  $-\pi/4$  . so now what is the actual value of  $\arcsin [(-15)/(17)]$  ,  $\arcsin [(15)/(-17)]$  . do they have different value like  $\arctan$  or do they have same value ? then why ???

### Solution

Since none of the six trigonometric functions are one-to-one, they are restricted in order to have inverse functions. Using function in the sense of multivalued functions, the function  $y = \arctan(x)$  is defined so that  $\tan(y) = x$ . There are multiple numbers  $y$  such that  $\tan(y) = x$ ; for example,  $\tan(-\frac{\pi}{4}) = -1$ , but also  $\tan(\frac{3\pi}{4}) = -1$ ,  $\tan(-\frac{5\pi}{4}) = -1$ , etc. When only one value is desired, the function may be restricted to its principal branch. With this restriction, for each  $x$  in the domain the expression  $\arctan(x)$  will be evaluated only to a single value, called its principal value. Principal branch for  $\arctan(x)$  is  $-\frac{\pi}{2} \leq y < \frac{\pi}{2}$ .

Thus  $\arctan(-1) = -\frac{\pi}{4}$  lies in quadrant IV where  $\sin(x) < 0, \cos x > 0$ .

Principal branch for  $\arcsin(x)$  is  $-\frac{\pi}{2} \leq y < \frac{\pi}{2}$ .

Thus  $\arcsin\left(-\frac{15}{17}\right)$  lies in quadrant IV where  $\sin(x) < 0, \cos x > 0$ .