Answer on Question #50655 – Math –Trigonometry

$Sin^{-1}(co\,s\,\theta) = \left(\frac{\pi}{2}\right) - \theta$ or $\left(\frac{\pi}{2}\right) + \theta$ I think both are correct but not sure.?

Here my thinking

sin^(-1)(cosθ)=sin^(-1)(sin ((π/2) - θ))=(π/2) - θ

Or in another way

sin^(-1)(cosθ)=sin^(-1)(sin ((π/2)+ θ))= (π/2) + θ)

I want to differentiate $Sin^{-1}(co\,s\,\theta)$. So what should we differentiate (π/2) - θ or (π/2) +θ. please let me know

Solution

You are right.

$$Sin^{-1}(co\,s\,\theta) = \left(\frac{\pi}{2}\right) - \cos^{-1}(co\,s\,\theta) = \left(\frac{\pi}{2}\right) - \theta.$$

But

$$\cos\theta = co\,s(-\theta).$$

So,

$$sin^{-1}(co\,s\,\theta) = sin^{-1}(co\,s(-\theta)) = \left(\frac{\pi}{2}\right) - \cos^{-1}(co\,s(-\theta)) = \left(\frac{\pi}{2}\right) + \theta.$$

You need

$$\frac{d}{d\theta}\left(sin^{-1}(co\,s\,\theta)\right) = \frac{d}{dco\,s\,\theta}\left(sin^{-1}(co\,s\,\theta)\right)\cdot\frac{d}{d\theta}\left((co\,s\,\theta)\right) = -\frac{1}{\sqrt{1-(co\,s\,\theta)^2}}\cdot\sin\theta = -\frac{\sin\theta}{|\sin\theta|}$$
$$= -Sign(\theta).$$

where

$$Sign(\theta) = \begin{cases} 1, when\ \theta > 0 \\ 0, when\ \theta = 0 \\ -1, when\ \theta < 0 \end{cases}$$