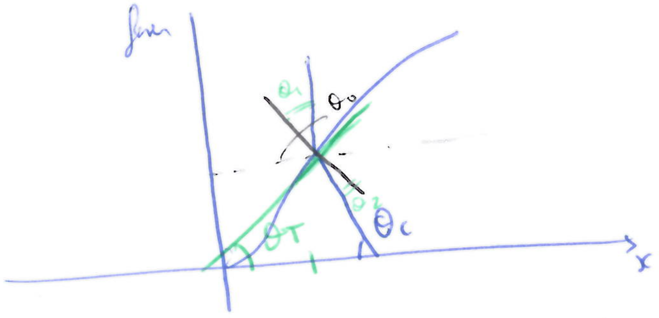
It is also possible to consider pre-fixed arbitrary curves $f(x)$ for the prism and see what range of angles can be coupled using these.

Lets consider an arbitrary shape $f(x)$.



• Coupling will occur if angle at the flat side of the prism is θ_c.

The following still hold:

$$\begin{cases} \theta_0 = -\theta_T + \theta_1 + \frac{\pi}{2} \\ \theta_2 = \theta_T + \theta_c - \frac{\pi}{2} \\ n_a \sin\theta_1 = n_p \sin\theta_2 \end{cases} \Rightarrow \theta_1 = \sin^{-1}\left(\frac{n_p}{n_a}\sin(\theta_T + \theta_c - 90)\right)$$

$$\Rightarrow \theta_0 = -\theta_T + \frac{\pi}{2} + \sin^{-1}\left(\frac{n_p}{n_a}\sin(\theta_T + \theta_c - 90)\right)$$

Now $\theta_T = \tan^{-1}\left(\frac{\partial f}{\partial x}\right)$ from before.

and if we fix $\theta_c \pm \delta$ the right value for the given frequency we will get coupling.

Hence, the values of θ_0 that can be coupled for a given curve $f(x)$ will be:

$$\boxed{\theta_0 = -\tan^{-1}\left(\frac{\partial f}{\partial x}(x)\right) + \frac{\pi}{2} + \sin^{-1}\left(\frac{n_p}{n_a}\sin\left(\tan^{-1}\left(\frac{\partial f}{\partial x}(x)\right) + \theta_c - \frac{\pi}{2}\right)\right)}$$

Can use the above equation in Maple with different curves $f(x)$ to see which would allow a broader range of angles to be coupled.