0.1 τ

0.1.1 Calculating τ

As we note above, $\sin(\theta) = \cos(\theta)$ at $\theta = \tau * \frac{1}{8}$

This is also where $\tan(\theta) = 1$.

$\arctan(k) = \arctan(a) + \int_a^k \frac{1}{1+y^2} \delta y$

We start from $a = 0$.

$\arctan(k) = \arctan(0) + \int_0^k \frac{1}{1+y^2} \delta y$

We know that one of the results for $\arctan(0)$ is 0.

$\arctan(k) = \int_0^k \frac{1}{1+y^2} \delta y$

We want $k = 1$

$\arctan(1) = \int_0^1 \frac{1}{1+y^2} \delta y$

$\frac{\tau}{8} = \int_0^1 \frac{1}{1+y^2} \delta y$

$\tau = 8 \int_0^1 \frac{1}{1+y^2} \delta y$

We know that the $\cos(\theta)$ and $\sin(\theta)$ functions cycle with period τ.

Therefore $cos(n.\tau) = \cos(0)$

0.1.2 Calculating τ

As we note above, $\sin(\theta) = \cos(\theta)$ at $\theta = \tau * \frac{1}{8}$

This is also where $\tan(\theta) = 1$.

$\arctan(k) = \arctan(a) + \int_a^k \frac{1}{1+y^2} \delta y$

We start from $a = 0$.

$\arctan(k) = \arctan(0) + \int_0^k \frac{1}{1+y^2} \delta y$

We know that one of the results for $\arctan(0)$ is 0.

$\arctan(k) = \int_0^k \frac{1}{1+y^2} \delta y$

We want $k = 1$

$\arctan(1) = \int_0^1 \frac{1}{1+y^2} \delta y$

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$\tau = 8 \int_0^1 \frac{1}{1+y^2} \delta y$

We know that the $\cos(\theta)$ and $\sin(\theta)$ functions cycle with period τ.

Therefore $cos(n.\tau) = \cos(0)$