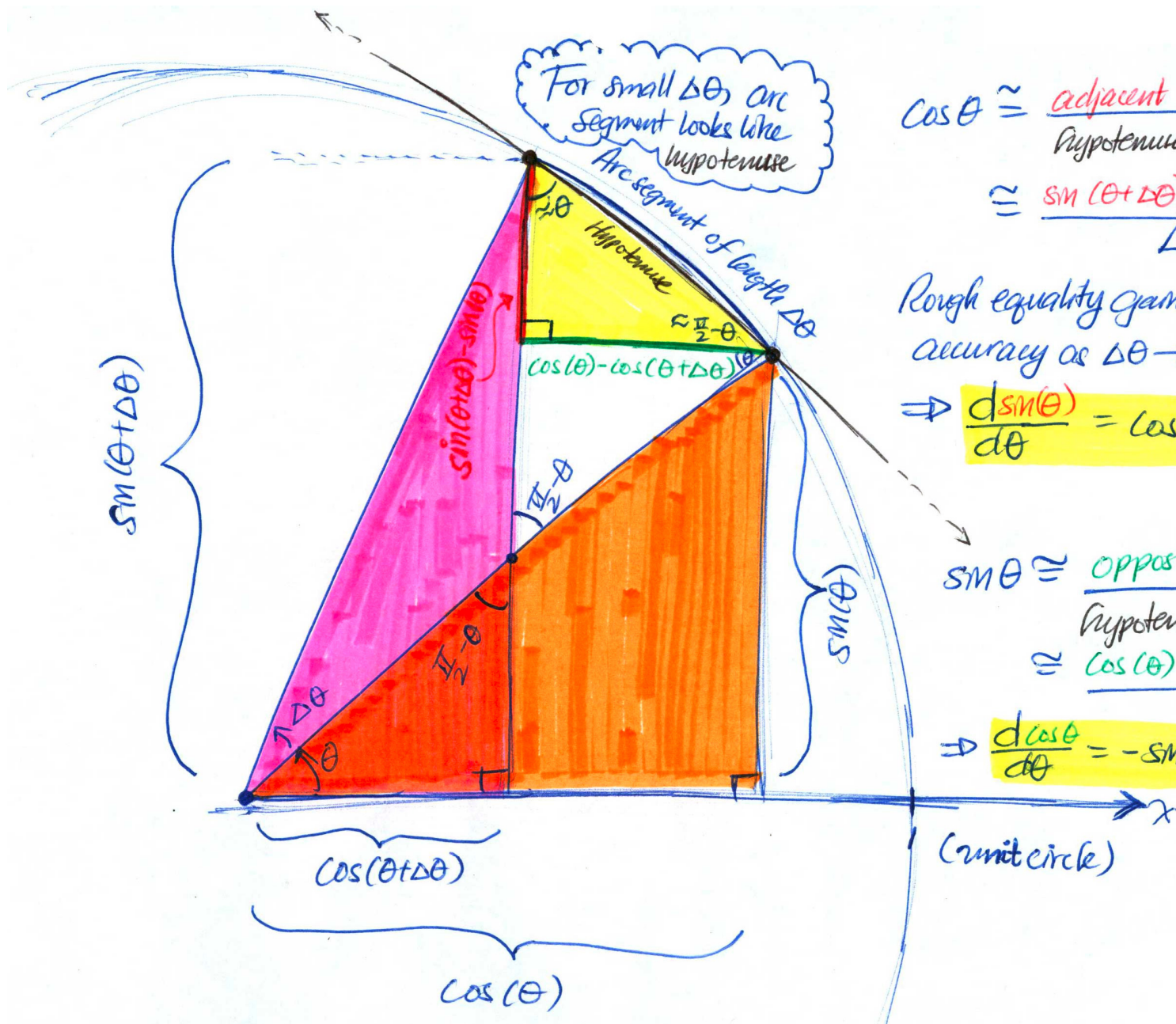


Derivatives of the circle functions



$$\begin{aligned} \cos \theta &\approx \frac{\text{adjacent length}}{\text{hypotenuse length}} \\ &\approx \frac{\sin(\theta + \Delta\theta) - \sin(\theta)}{\Delta\theta} \end{aligned}$$

Rough equality gains arbitrary accuracy as $\Delta\theta \rightarrow 0$.

$$\Rightarrow \frac{d\sin(\theta)}{d\theta} = \cos(\theta)$$

$$\begin{aligned} \sin \theta &\approx \frac{\text{opposite length}}{\text{hypotenuse length}} \\ &\approx \frac{\cos(\theta) - \cos(\theta + \Delta\theta)}{\Delta\theta} \end{aligned}$$

$$\Rightarrow \frac{d\cos \theta}{d\theta} = -\sin(\theta)$$