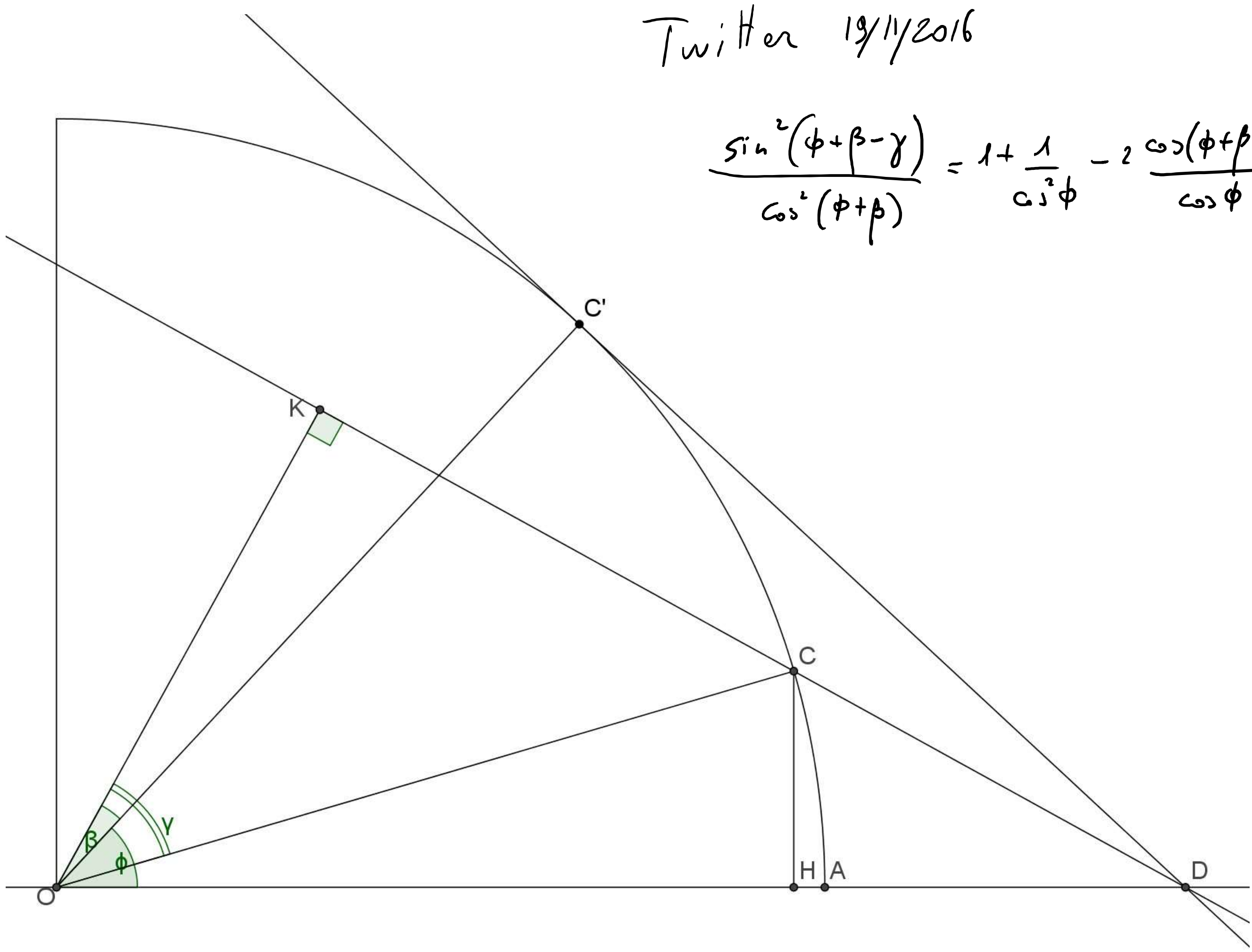
Strogatz-Vanderbei problem

Sunday, November 20, 2016 11:02



Twitter 19/11/2016

$$\frac{\sin^2(\phi+\beta-\gamma)}{\cos^2(\phi+\beta)} = 1+\frac{1}{\cos^2\phi} - 2\,\frac{\cos(\phi+\beta-\gamma)}{\cos\phi}$$

$$\overline{CD}^2 = 1+\frac{1}{\cos^2\phi} - \frac{2\cos(\phi+\beta-\gamma)}{\cos\phi} \quad \text{(law of cosines)} \qquad \left[\overline{OD} = \frac{1}{\cos\phi}\right]$$

$$\frac{\sin(\phi+\beta-\gamma)}{\cos(\phi+\beta)} = CD \cdot \longrightarrow \quad CD\cdot\cos(\phi+\beta) = \underbrace{\sin(\phi+\beta-\gamma)}_{CH}$$

$$\Downarrow$$

$$D\hat{C}H = \phi+\beta$$

$$\overline{OK} = \overline{OD}\cdot\cos(\phi+\beta)$$

but it's also $\overline{OK} = OC\cdot\cos\gamma \longrightarrow OK = \cos\gamma = \frac{1}{\cos(\phi)}\cdot\cos(\phi+\beta)$

$$\frac{\cos(\phi+\beta)}{\cos\phi} = \cos\gamma \qquad \frac{\cos\phi\cos\beta - \sin\phi\sin\beta}{\cos\phi} = \cos\gamma$$

$$\cos\beta - \tan\phi\cdot\sin\beta = \cos\gamma \longrightarrow \tan\phi = \frac{\cos\beta-\cos\gamma}{\sin\beta}$$

$$\cos\phi = \frac{1}{\sqrt{1+\tan^2\phi}} \quad \left(\text{assuming } 0\le\phi\le\frac{\pi}{2}\right) \text{ etc}$$