

A quick note on business calculus

“What if sin and cos are differentiated four times ?”



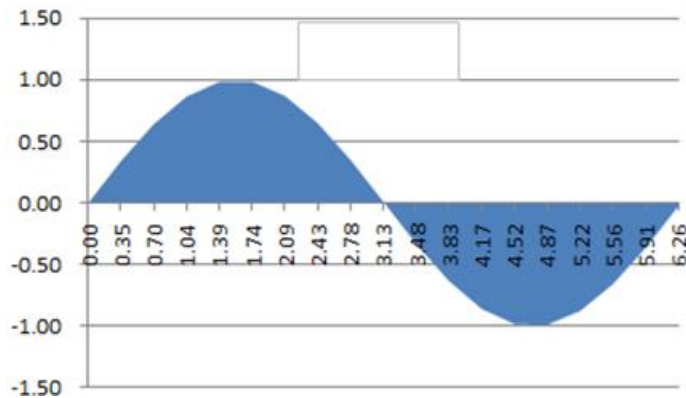
What if sin and cos are differentiated four times? → return to original form.

e.g. Differentiating sin x four times....

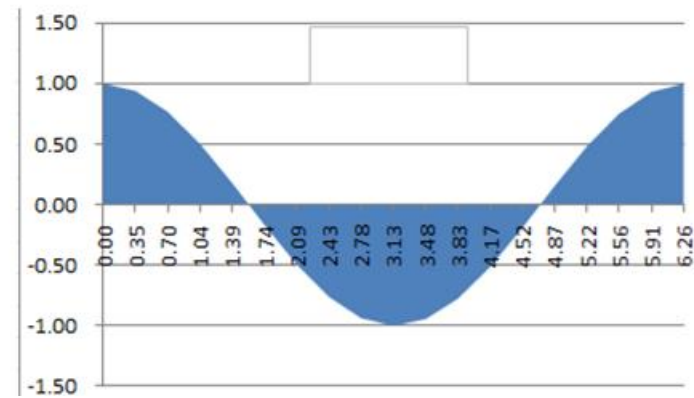
1. $(\sin x)' = \cos x$
2. $(\cos x)' = -\sin x$
3. $(-\sin x)' = -\cos x$
4. $(-\cos x)' = \sin x$ return to sin x



Waveform of sin x



Waveform of cos x



A single differentiation advances the phase by $\pi/2$. If you differentiate 4 times, you get back to $(\pi/2) \times 4 = 2\pi$. Differentiating cos x four times return to cos x as well.