PROVE $\frac{d}{dx} \cos X = -\sin X \ldots$

$$\frac{d}{dx} \cos X = \lim_{h \to 0} \frac{\cos(x+h) - \cos X}{h}$$

$$= \lim_{h \to 0} \left[\frac{\cos X \cos h - \sin X \sin h - \cos X}{h} \right]$$

$$= \lim_{h \to 0} \left[\frac{\cos X \cos h - \cos X}{h} \right] - \lim_{h \to 0} \left(\frac{\sin X \sin h}{h} \right)$$

$$= (\cos X) \lim_{h \to 0} \left(\cancel{\frac{\cos h - 1}{h}} \right) \to 0 - (\sin X) \lim_{h \to 0} \cancel{\frac{\sin h}{h}} \to 1$$

$$= (\cos X)(0) - (\sin X)(1)$$

$$= -\sin X$$