8.10 $\quad \big(\cot(x)\big)' = \left(\dfrac{\cos(x)}{\sin(x)}\right)' = \dfrac{\big(\cos(x)\big)'\sin(x) - \cos(x)\big(\sin(x)\big)'}{\sin^2(x)}$

$$= \frac{-\sin^2(x) - \cos^2(x)}{\sin^2(x)} = -\frac{\sin^2(x) + \cos^2(x)}{\sin^2(x)} = -\frac{1}{\sin^2(x)}$$

$$= -\frac{\sin^2(x)}{\sin^2(x)} - \frac{\cos^2(x)}{\sin^2(x)} = -1 - \left(\frac{\cos(x)}{\sin(x)}\right)^2 = -1 - \cot^2(x)$$