Example 4 Prove that the function $f(x) = \tan x - 4x$ is strictly decreasing on $\left(\frac{-\pi}{3}, \frac{\pi}{3}\right)$.

Solution $f(x) = \tan x - 4x \Rightarrow f'(x) = \sec^2 x - 4$

When $\frac{-\pi}{3} < x < \frac{\pi}{3}$, $1 < \sec x < 2$

Therefore, $1 < \sec^2 x < 4 \Rightarrow -3 < (\sec^2 x - 4) < 0$

Thus for $\frac{-\pi}{3} < x < \frac{\pi}{3}$, $f'(x) < 0$

Hence f is strictly decreasing on $\left(\frac{-\pi}{3}, \frac{\pi}{3}\right)$.