Exercise 1. Define a sequence $\{a_n\}$ by $a_1 = 1$ and $a_{n+1} = \cos\left[\arctan(a_n)\right]$ for $n \geq 1$. Find a formula for a_n and determine $\lim\limits_{n \to \infty} a_n$.

Exercise 2. Evaluate the infinite product

$$\prod_{n=2}^{\infty} \frac{n^3 + 1}{n^3 - 1}.$$