1. Let $n$ be a fixed (but arbitrary) positive integer. Compute the value of

$$I_n := \int_0^{\pi/2} \frac{\cos^n x}{\cos^n x + \sin^n x} \, dx.$$  

(Write out another expression for $I_n$ by using the substitution $u = \pi/2 - x$. Average the two expressions.)

2. Use the previous problem to compute

$$\int_0^1 \frac{dt}{t + \sqrt{1-t^2}}.$$