**6.** (10 points) **(a)** Explain why $\int_0^{\pi/3} \dfrac{\cos x}{\sin^2 x}\, dx$ is an improper integral.

**(b)** Show how the improper integral in part (a) is defined mathematicially.

**(c)** If the improper integral in part **(a)** converges, then use your answer from part **(b)** to calculate the value to which it converges. If the improper integral in part **(a)** does not converge, then explain why not. Show your work.