HW 3

1. At a gas planet with variable viscosity, the travel speed is proportional to the radius r from the center, $v(r) = \alpha\, r$. What is the fastest path from a point $A = r_1, \theta_1)$ to a point $B = (r_2, \theta_2)$, where θ is a polar angle in the plane that passes through the center and points A and B.

2. Show that the problem

$$\min_{u(x)} \int_{-\pi}^{\pi} \left[(u')^2(1 - \cos x)\right] dx, \quad u(-\pi) = -1,\ u(\pi) = 1$$

does not have a regular (continuous) solution. Regularize the problem, find the solution, and plot the graphs of the extremals with several values of the regularization parameter.