6. RUNNING ON ICE (4 points) A boy is running on a large field of ice with velocity $v = 5\,\mathrm{m/s}$ toward the north. The coefficient of friction between his feet and the ice is $\mu = 0.1$. Assume as a simplification that the reaction force between the boy and the ice stays constant (in reality it varies with every push, but the assumption is justified by the fact that the value averaged over one step stays constant).

i) *(2 points)* What is the minimum time necessary for him to change his moving direction to point towards the east so that the final speed is also $v = 5\,\mathrm{m/s}$?

ii) *(2 points)* What is the shape of the optimal trajectory called?