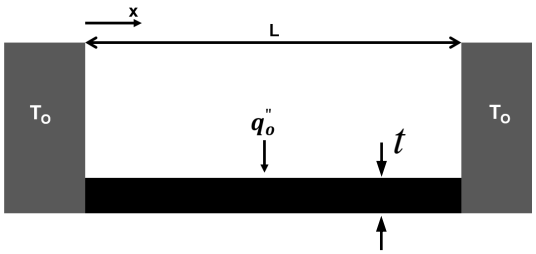
Part 1 (100 points).

A thin flat plate of length *L*, thickness *t*, and width *W* >> *L* is thermally joined to two large sinks that are maintained at a temperature of T_O. The bottom of the plate is well insulated, while a uniform heat flux to top surface of plate is denoted by q''_O as shown in the figure.



(a) Derive the differential equation that determines the steady-state temperature distribution *T(x)* in the plate. (**30 points**)

(b) Calculate the total heat loss from the plate to the sinks. (**20 points**)

(c) Where does the maximum temperature occur in the plate and solve for the maximum temperature. (**30 points**)

(d) Draw the temperature profile. (**20 points**)