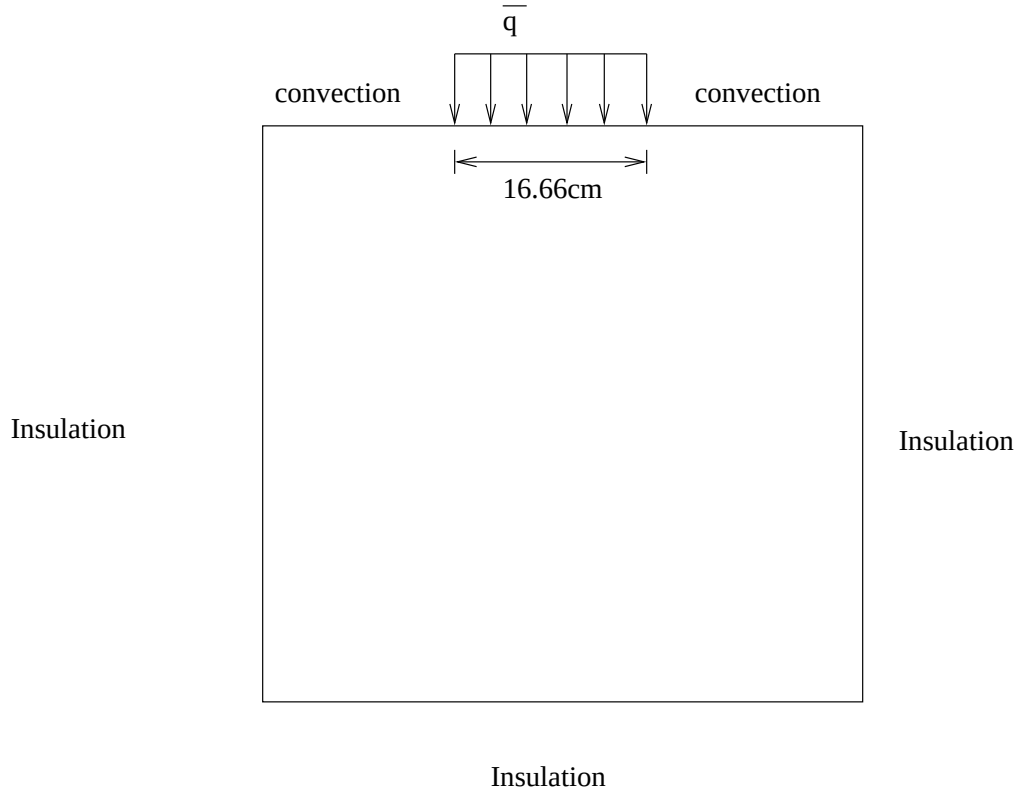
HW 6: Due April 1

1. Consider a 304 stainless steel square plate of side length 50 cm, density $\rho = 8000$ kg/m^3, heat capacity $c_v = 400$ J/kgC, and conductivity $k = 13.8$ W/mC. If you compute a dymanic FEA solution using 2500 3-node triangular elements and a forward Euler time integration scheme. How large can you set the time step? Consider the cases of lumped and consistent mass.

2. Consider the same plate as in Problem 1 with the boundary conditions as shown below but now with a conductivity of $k = 250$ W/mC. You would like to heat the edge of the plate as much as possible in 600 s without having the center of the plate exceed a temperature of 100 C. How large can you make $\bar{q}$? How hot will the edge get? Assume $h = 10$ W/m^{2}C on the convective parts of the boundary with a far field temperature of 30 C. The initial temperature of the plate is also 30 C.



Your answer should be in the form of report. Make sure that you consider the convergence of your results so that you can address the issue of number of significant digits.