UNIVERSITY OF CALIFORNIA BERKELEY
Department of Civil Engineering
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Structural Engineering,
Mechanics and Materials
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HW 5: Due 3/5/04

1. Consider a 304 stainless steel square plate of side length 50 cm, density $\rho = 8000\ \mathrm{kg/m^3}$, 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. Hint: the book (chap 8) has already derived for you most of what you need for this problem.

2. Consider the same plate as in problem 1 with the boundary conditions as shown below. You would like to heat the edge of the plate as much as possible in 60 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 $h = 10\ \mathrm{W/m^2C}$ 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.