ME 565 HW#4 Winter 2009
Due Wednesday Feb. 25

Again on this assignment, you should employ computing resources and include plots to communicate your results.

Section 12.8 # 11, 13

Section 12.9 # 6, 15

Section 12.11 # 6

1. Find the steady state temperature in a solid hemisphere ($0 \le r \le b, 0 \le \varphi \le \pi/2, 0 \le \vartheta \le 2\pi$) if the planar base is held at zero temperature while the hemispherical portion is kept at constant temperature 100.

2. Find the steady-state temperature distribution in a spherical shell ($a \le r \le b$) if the inner surface is held at zero temperature while the outer surface has temperature distribution $u(b, \varphi) = \varphi(\pi - \varphi)$.

3. Determine the vibration of a semi-circular membrane ($0 \le r \le b, 0 \le \vartheta \le \pi$) with initial conditions $u(r, \vartheta, 0) = \vartheta(\pi - \vartheta)r(b - r)$, $u_t(r, \vartheta, 0) = 0$. Determine mode shapes, nodal lines and natural frequencies for at least the first 5 modes. Create an animation of the membrane in motion and turning a graphic showing some frames from the animation (e.g. using GraphicsGrid).