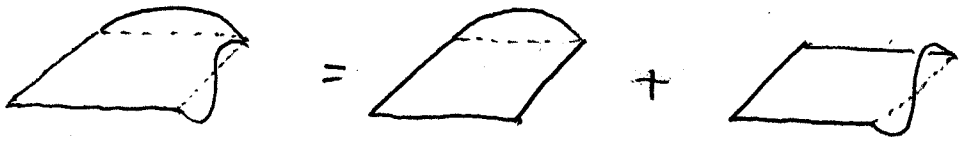
MTHSC 208: Spring 2011

Week 15 summary:

- Solving Laplaces equation in 2D: $u_{xx} + u_{yy} = 0$

  Separate variables, do it piece-by-piece, use superposition



- 2D heat equation: $u_t = \nabla^2 u$

  Solution is $u(x, y, t) = u_h(x, y, t) + u_{ss}(x, y)$

  where $u_h(x, y, t)$ solves the homogeneous eq'n (zero-boundary conditions)

- Solving the 2D heat and wave equations (homogeneous)

  * Assume $u(x, y, t) = f(x, y)\, g(t)$, & separate variables
  * Get the Helmholtz eq'n for f: $\nabla^2 f = \lambda f$, $\lambda = -(n^2 + m^2)$
  * The general solution is $\sum_{n=1}^{\infty} \sum_{m=1}^{\infty} u_{nm}(x, y, t)$
  * Use the initial condition(s): Plug in $t = 0$ and equate coefficients.