Math 241
Hints for midterm 2 practice

1. Let $u_E$ satisfy $\Delta u_E = 0$ and the boundary conditions

\[
\begin{align*}
u_E(0, y, t) &= 0, \quad (u_E)_y(x, 0, t) = 0 \\
u_E(L, y, t) &= 0, \quad u_E(x, H, t) = g(x).
\end{align*}
\]

Let $v = u - u_E$. What equation, BCs, and ICs does $v$ satisfy?

3. The standard Sturm-Liouville form is \( \frac{d}{dx} (e^x \phi') + \lambda e^x \phi = 0 \). The answer to (d) is “yes” (and “no” for the bonus).

4. Product solutions look like $\rho^n P_n^0(\cos \phi)$.

5. A good reference temperature is $r(x, t) = \frac{x^2}{2}$. 