1. (5 points) Find the first two coefficients of the Fourier-Legendre expansion of

\[ f(x) = \begin{cases} 
  2, & \text{if } -1 < x < 0; \\
  -1, & \text{if } 0 \leq x < 1. 
\end{cases} \]

2. (5 points) Find product solutions, if possible, to the partial differential equation

\[ \frac{\partial u}{\partial x} = 25 \frac{\partial u}{\partial y}. \]