Problem 1. Verify that the following functions are solutions of the wave equation for a suitable value of $c$.
   a) $u = x^3 + 3xt^2$,  b) $u = sin(2ct)sin(2x)$.

Problem 2. Verify that the function $u(x, t) = a \ln(x^2 + y^2) + b$ satisfies Laplace’s equation and determine $a$ and $b$ so that $u$ satisfies the boundary conditions $u = 100$ on the circle $x^2 + y^2 = 1$ and $u = 0$ on the circle $x^2 + y^2 = 100$.

Problem 3. PDEs SOLVABLE AS ODEs. This happens if a PDE involves derivatives with respect to one variable only (or can be transformed to such a form), so that the other variable(s) can be treated as parameter(s). Solve for $u = u(x, y)$:
   a) $u_{xx} + 4u = 0$,  b) $25u_{yy} - 4u = 0$,  c) $u_x = 2xyu$,  d) $u_{xy} = 0$.

Problem 4. Find the deflection $u(x, t)$ of the string of length $L = 20\text{cm}$ and $c^2 = 1$ when it is set oscillating by displacing its mid-point a distance 1 cm from its rest position (see the figure) and releasing it with zero initial velocity.

\begin{center}
\includegraphics[width=0.5\textwidth]{graph.png}
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