1. Solve \( \int_{-\infty}^{\infty} u(x-t)e^{-at^2} \, dt = e^{-bx^2} \).

2. Solve

\[
\begin{aligned}
    &u_{tt} - c^2 u_{xx} + \alpha u_t = 0 \quad -\infty < x < \infty, \ t > 0, \\
    &u(x,0) = f(x), \\
    &u_t(x,0) = g(x).
\end{aligned}
\]

3. Prove that the real and imaginary parts of an analytic function are harmonic.