1. Read Sections 1.1 and 1.2 from the textbook.

2. Problem 1.2.8 in Textbook (page 11).

3. Verify whether \( u(x, t) = 3t + x^2 \) satisfies the following heat equation:
\[
    u_t = \frac{3}{2} u_{xx}.
\]

4. Let \( \alpha \) and \( \beta \) be some positive constants. Determine the constant \( C \) such that
\[
    w(x, t) = e^{-\alpha t} \cos \beta x + Ct
\]
satisfies the following heat equation with a source term:
\[
    u_t = \frac{\alpha}{\beta^2} u_{xx} + 4, \quad t > 0, x \in \mathbb{R}.
\]

5. Specify the order of the following PDEs:
   - \( u_{tt} = u_x + u_y \)
   - \( u_t - u_x = 3x \)
   - \( 6u_{xx} + 6xu_{yy} = u \)

6. Consider the following heat equation
\[
    4u_t = u_{xx}, \quad x \in (0, 2), t > 0. \tag{1}
\]
Verify whether the following functions satisfy equation (1):
   - \( f(x, t) = 2 \sin(\pi x/2) \exp(-\pi^2 t/16) \)
   - \( g(x, t) = \sin(\pi x) \exp(-\pi^2 t/4) \)
   - \( h(x, t) = \sin(2\pi x) \exp(-\pi^2 t) \)
   - \( k(x, t) = f(x, t) - g(x, t) - h(x, t) \).