1. Solve the following differential equations.
   (a) \( y' + xy = x^3 \), with \( y(0) = 0 \).
   (b) \( xy' - 2y = x^5 \), with \( y(1) = 1 \).
   (c) \( y' \sin x + y \cos x = 1 \), where \( x \in (0, \pi) \).

2. Solve the following differential equations.
   (a) \( y'' + 2y' - 3y = 0 \).
   (b) \( y'' - 4y' + 4y = 0 \), with \( y(1) = 2 \) and \( y'(1) = -1 \).
   (c) \( y'' + 4y' + 5y = 0 \), with \( y(0) = 0 \) and \( y'(0) = 1 \).

3. A Bernoulli equation is of the form
   \( y'(x) + P(x) y(x) = Q(x) y^n \).
   If \( n = 0 \) or \( n = 1 \), this equation is linear, and we have learned how to solve.
   For any other value of \( n \), substitute \( u = y^{1-n} \) and show that \( u \)
   must be a solution of \( u' + (1 - n) Pu = (1 - n) Q \). This can be solved in \( u \)
   and so one can get \( y \).
   Use this strategy to solve \( xy' + y = -xy^2 \).