Problem 1. Give an estimate of the solution of $\frac{dx}{dt} = t^2 \cdot x$ with $x(1) = 2$ using Picard Iteration with six iterations.

Problem 2. Use the Euler, Heun, and Runge-Kutta methods to produce a numerical estimate of the solution of $\frac{dx}{dt} = t \cdot \sin(x)$ with $x(0) = 1$. Use $h = \frac{1}{10}$ and $n = 10$. Compare the results and the errors.

Problem 3 Use the Taylor Method to produce a polynomial approximation of the solution to $\frac{dx}{dt} = \sin(t) \cdot \cos(x)$ with $x(0) = 1$. Make the degree of the polynomial to be 5 and 10.

Problem 4. Use the Taylor Method to produce a numerical approximation of the solution to $\frac{dx}{dt} = \sin(t) \cdot \cos(x)$ with $x(0) = 1$. Use degree 3, 4, 5, and 6. Let $h = \frac{1}{10}$ and $n = 10$. Compare the solutions and the errors.

Problem 5. Convert the second-order differential equation $\frac{d^2x}{dt^2} + x = 0$, $x(0) = 1$, $x'(0) = 0$ to first-order.