# MAD 4401 QUIZ 1 FALL 2018 - JAMES KEESLING

**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.