

## MATH 267 Section E1 Additional Practice Midterm

**Problem 1**(7 points) Give an interval where the solution of the following boundary value problem is guaranteed to exist and be continuous.

$$y' = \frac{1}{t^2 - 2t + 1}y + \ln(t), \quad y\left(\frac{1}{2}\right) = 100.$$

**Problem 2**(7 points) Use Euler's method to approximate  $y(0.05)$  and  $y(0.1)$ , where  $y$  is the solution of the following boundary value problem

$$y' = e^y y + t^2, \quad y(0) = 0.$$

**Problem 3**(7 points) Find a fundamental set of solutions for the following linear homogeneous differential equation

$$y^{IV} + y = 0.$$

**Problem 4**(7 points) Find the general solution of

$$y' = \sin(t)y.$$

**Problem 5**(7 points) Give a particular solution of the equation

$$y'' + y = t + e^t,$$

using the method of undetermined coefficients.

**Problem 6**(7 points) Use the method of the integrating factor to solve the following linear first order differential equation

$$y' + 2y = e^t.$$

**Problem 7**(7 points) Solve the following separable differential equation

$$\frac{dy}{dx} = \frac{\cos(x)}{y}.$$