Name:

MATH240:–Final Exam

1		10	5		10
2		10	6		10
3		10	7		10
4		10	8		10
Total		40	Total		40

1. Find all solutions(if any), to

$$y'' - 4y' + 8y = 0, \quad y(0) = 0 = y(\pi)$$

2. Solve the IVP

$$y' + 2xy = 1, \quad y(0) = 1$$

You may leave your solution as an integral.

3. Solve

$$x^2y'' - xy' + y = x^2$$

4. Solve

$$y'' - 2y' + 2y = xe^x$$

5. Find a series solution to

$$y'' + 4xy' + (x^2 + 1)y = 0, \quad y(0) = 0, \;\; y'(0) = 1$$

You only have to write the first four nonzero terms of the series.

6. Find and classify all singular points of

$$(x^3 + 4x^2 + 4x)y'' + y' + \frac{2y}{x} = 0$$

7. Use Improved Euler's Method to approximate $y(1)$, given that

$$\frac{dy}{dx} = x^2y^2, \quad y(0) = 1$$

Use step size $h = 0.5$

8. Find y_0 such that the solution to the following IVP is a straight line

$$\frac{dy}{dx} = y - x, \quad y(-4) = y_0$$