

Ma 530 Midterm Exam 03A

You are to answer **all** of the questions below and have 4 hours to complete the exam. You may use the text and notes while taking this exam.

(1a 30 pts.) Solve

$$(x + y)dx + x \ln x dy = 0$$

(1b 30 pts.) Solve using Laplace transforms

$$y'' + 2ty' - 4y = 1 \quad y(0) = y'(0) = 0$$

(2) Solve the following equations. Be sure to give the general solution.

(2a 30 pts.)

$$y'' - 4y' + 4y = (x + 1)e^{2x}$$

(2b 30 pts.)

$$y'' + y = x \cos x - \cos x$$

(3) Consider the equation

$$x^2 y'' + x(x - 2)y' + (x^2 + 2)y = 0$$

which has a regular singular point at $x = 0$.

(3a 10 pts.) Find the indicial equation and solve it.

(3b 35 pts.) Find the first **four** nonzero terms in the series solution corresponding to the **larger** root of the

indicial equation.

(3c 35 pts.) Find a second linearly independent solution of the equation. Give the first **three** nonzero terms

of this solution.