MAP 2302: Homework – due Monday, July 23 Name:

1. Find the general power series solution of the differential equation in powers of x (that is, about $x_0 = 0$)

$$2y'' + xy' + y = 0$$

2. Find the inverse Laplace transform $L^{-1}\left(\frac{1}{s(s^2+4)}\right)$ in two different ways:

(a) using partial fractions (and the table)

(b) using convolution (and the table).

3. Use Laplace transform to solve the following system of linear ODEs

$$\begin{cases} x_1'' + 5x_1 - 2x_2 = 0 \\ x_2'' - 2x_1 + 2x_2 = 0 \end{cases}$$

with initial conditions $x_1(0) = -1,\ x_1'(0) = 0,\ \ x_2(0) = 2, x_2'(0) = 0.$

4. Given that a is a positive constant, use the definition to find the Laplace transform of the step-function

$$u_a(t) = \begin{cases} 0, & t < a \\ 1, & t > a \end{cases}$$

Note: With this you justified formula (15) from the Laplace transform table (on page 500 textbook).