Problem 1 (8 points): For each of the following two equations,

a) Write down the general solution of the equation.

b) Using the initial value, write down the equations for $c_1$ and $c_2$ in matrix-vector form.

c) Find the particular solution of the differential equation with initial value and the range of validity of your solution.

i. $3x^2y'' - 3xy' + 6y = 0 \quad y(1) = 2 \quad y'(1) = 5$

ii. $x^2y'' + 3xy' + y = 0 \quad y(e) = 0 \quad y'(e) = e^{-1}$
Problem 2 (2 points): Go on wikipedia.org, and search for “invertible matrix”. List the ten properties that are equivalent to being invertible that we have talked about in class. (There are 16 properties listed there in total, but we have only talked about 10 of them so far, and we’ll talk about an eleventh one soon.)