**PROBLEM SET 5**

Exercise 1 . SIR Model of Virus Spread

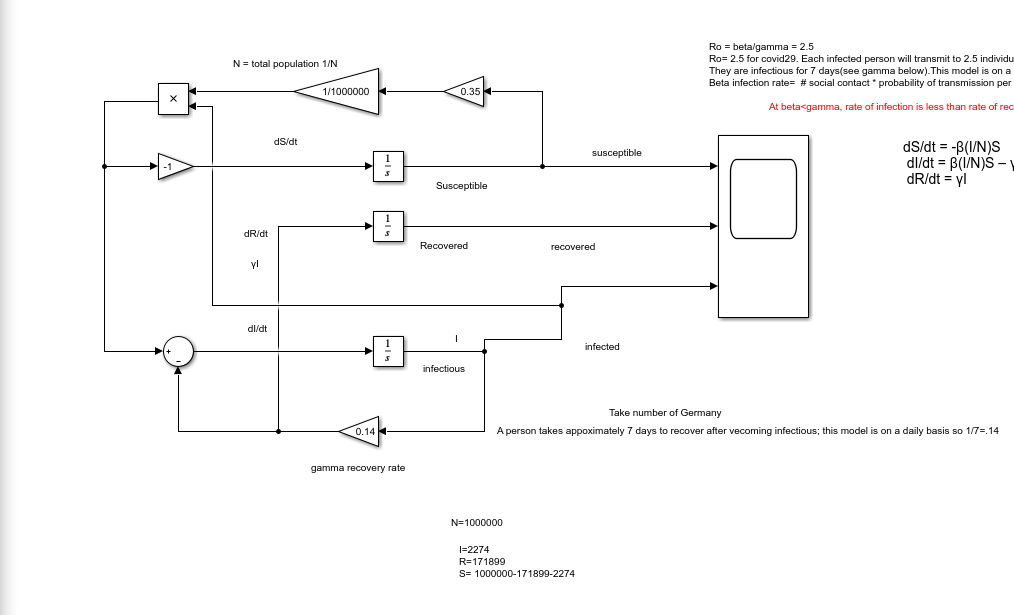
The number of Germany was provided in this Simulink model

N = 1 000 000

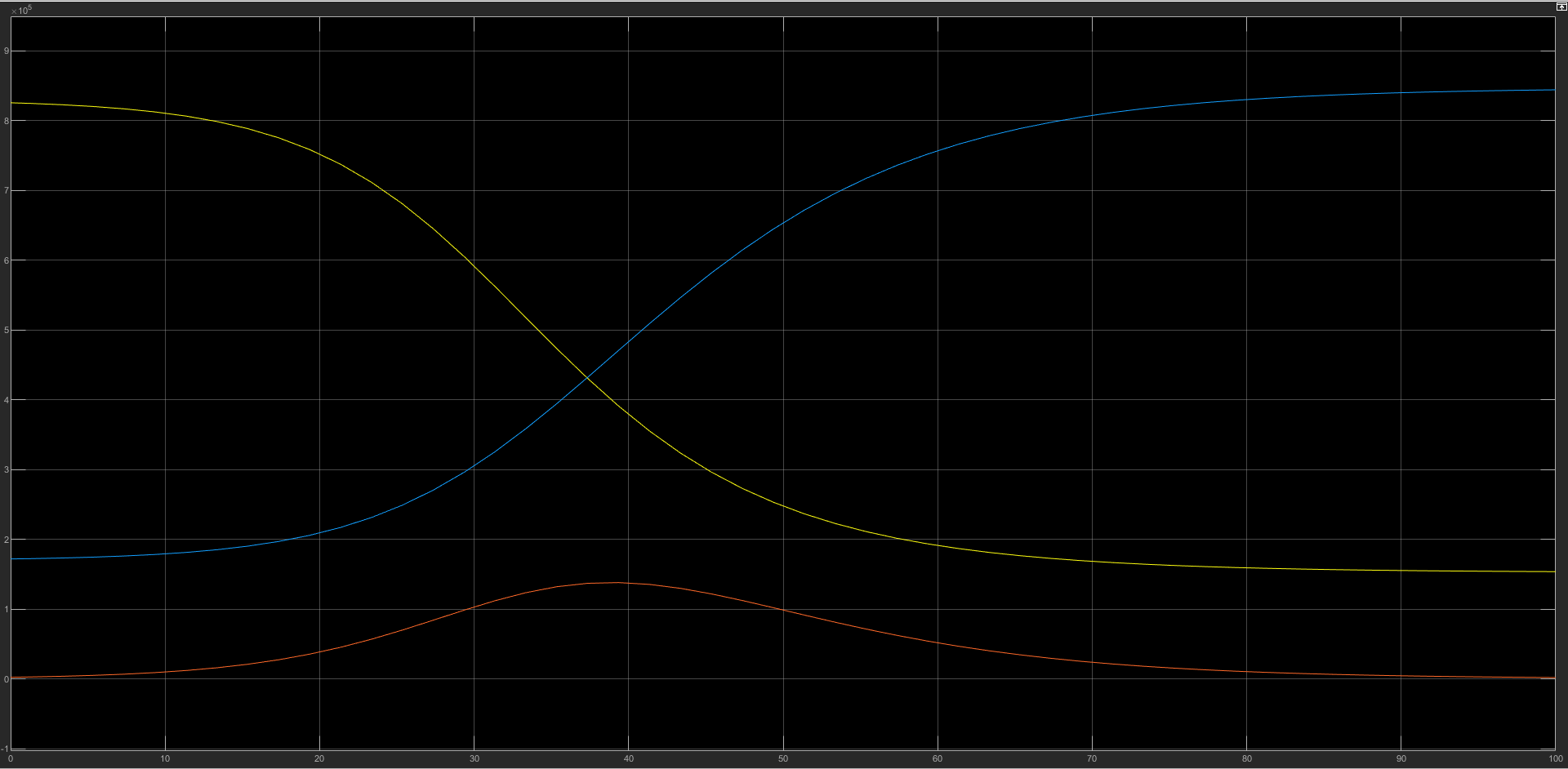
I = 2 274

R= 171 899

S= 1 000 000-171 899 – 2 274= 825 827

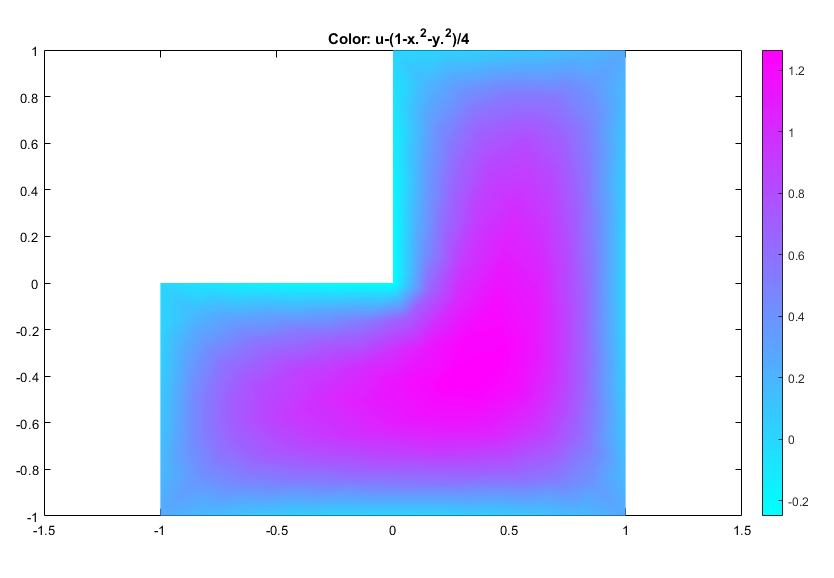
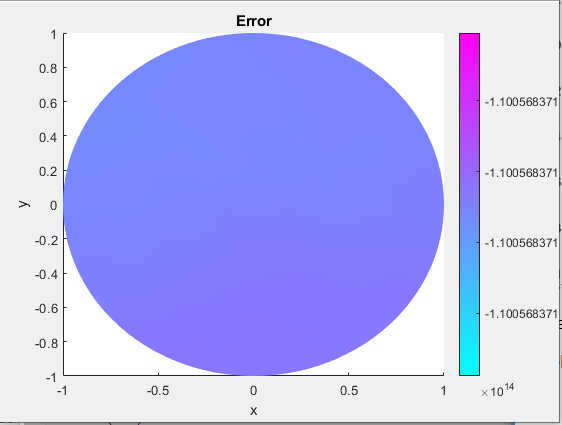
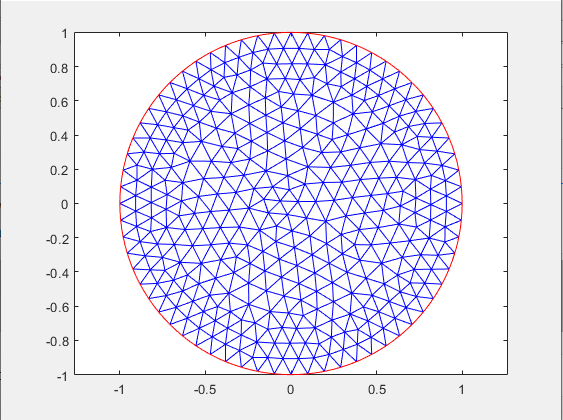
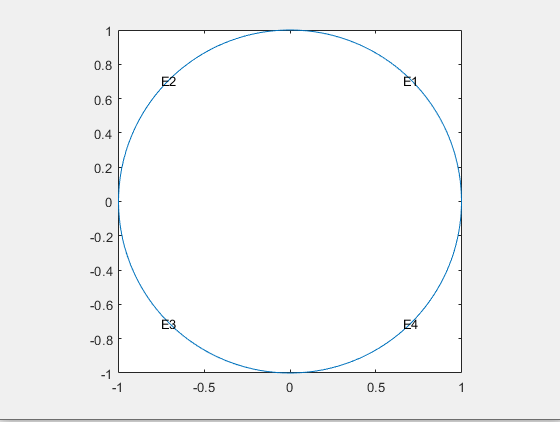


The result of the scope



With R = 0.17, I =0.023 and S=0.825, Susceptible is falling while Recover Rate is rising and the Infected goes up to a peak then diminish.

Exercise 2: Poisson’s Equation

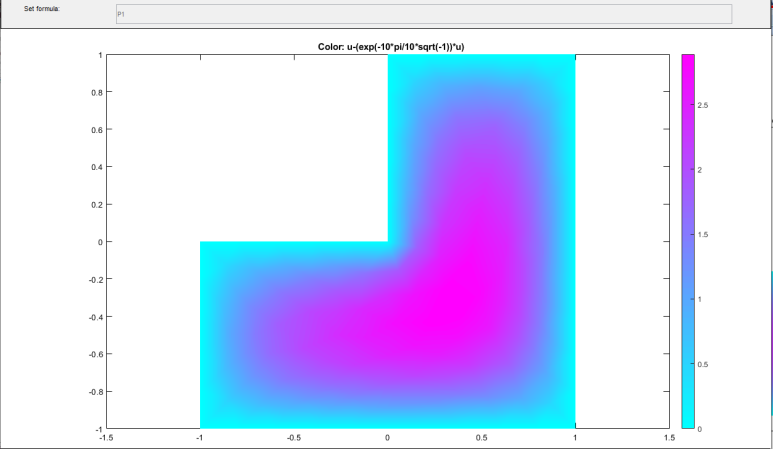
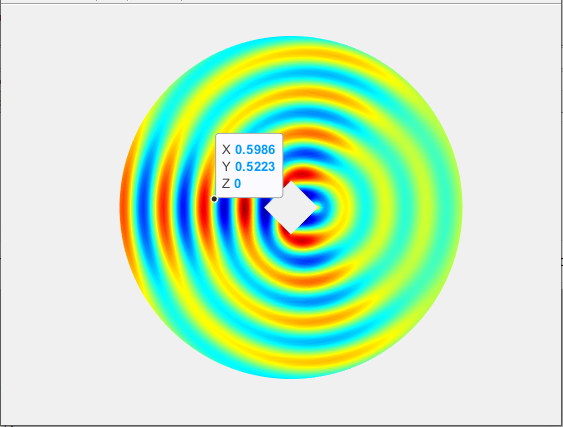
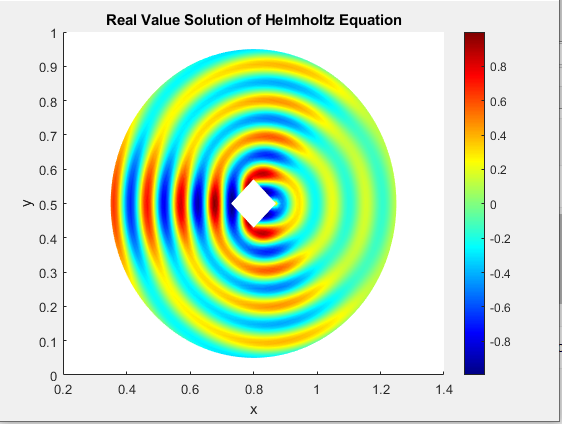
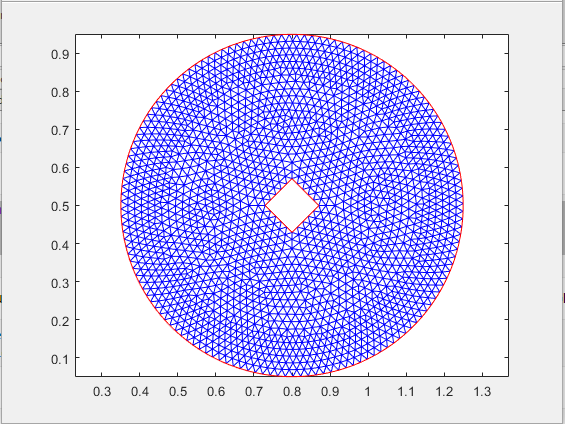


Exercise 3:

Helmholtz’s Equation:

So we have in this exercise:

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Exercise 4: Heat Equation

Heat Equation:

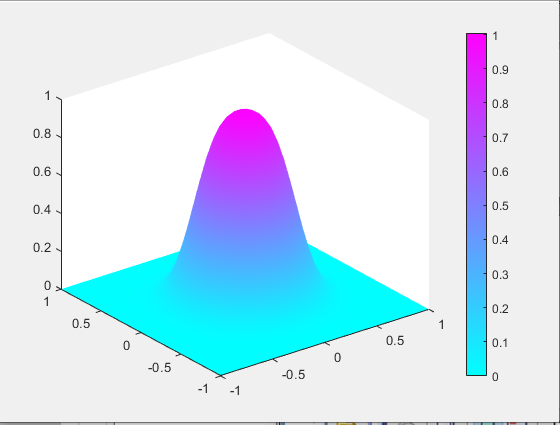
Initial Conditions: The temperature =1 and the surrounding =0

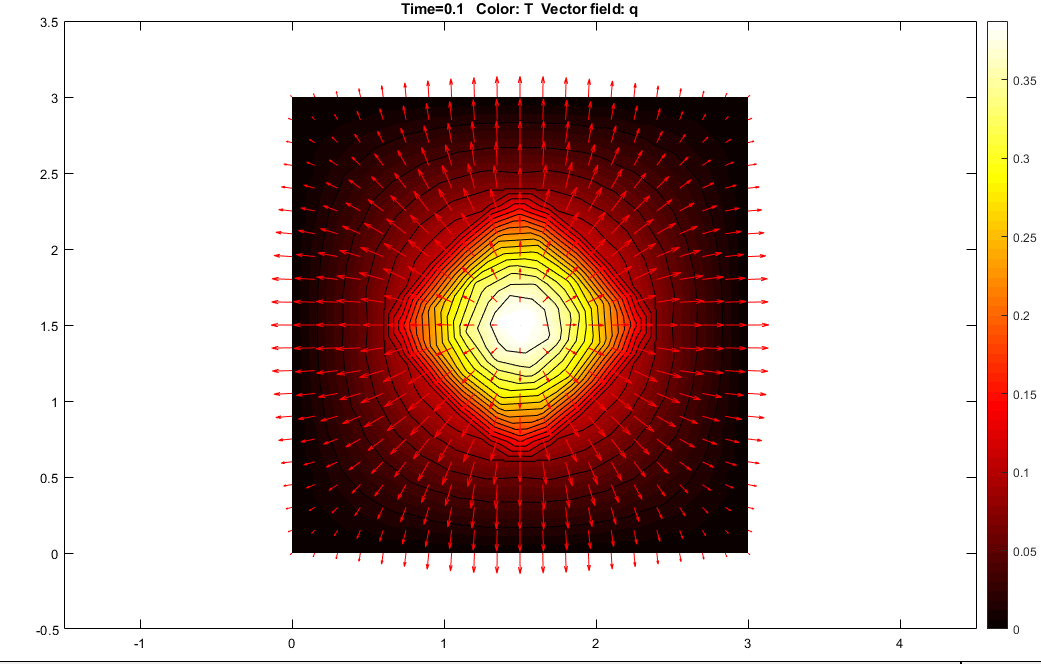
Boundary condition: Zero temperature on boundary.

Heat Equation is on cylindrical coordinates with r = 1.

Initial Conditions:

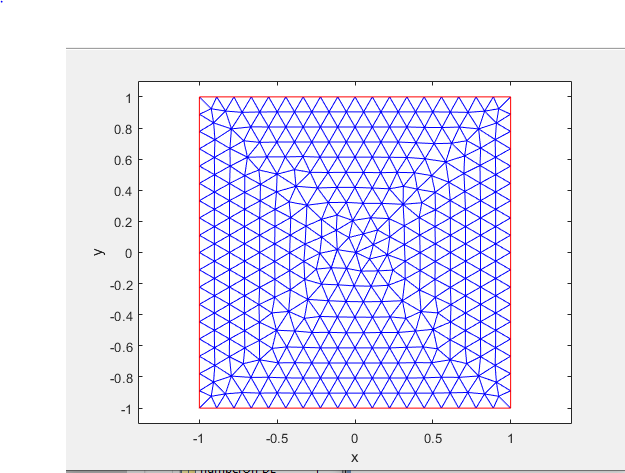
Boundary condition:

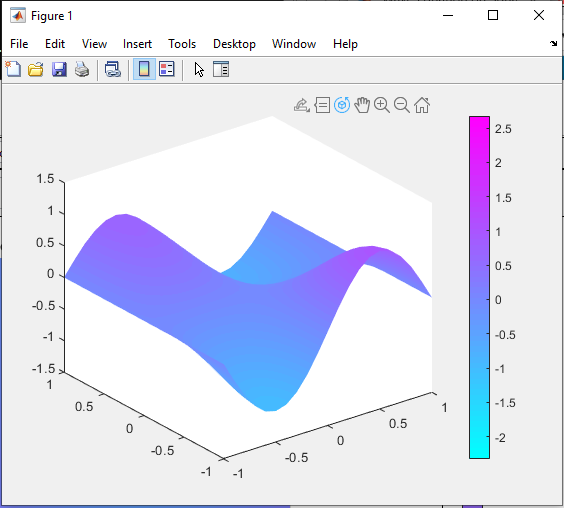
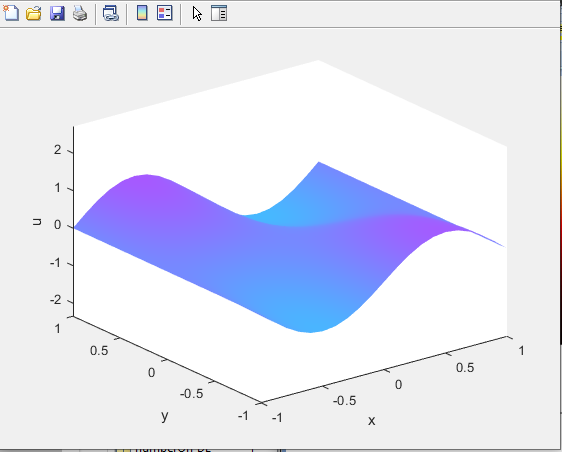




The heat equation is a partial differential equation that describes how the distribution of some quantity evolves over time in a solid medium, as it spontaneously flows from places where it is higher towards places where it is lower.

Exercise 5: Wave Equation





Set the following initial conditions: