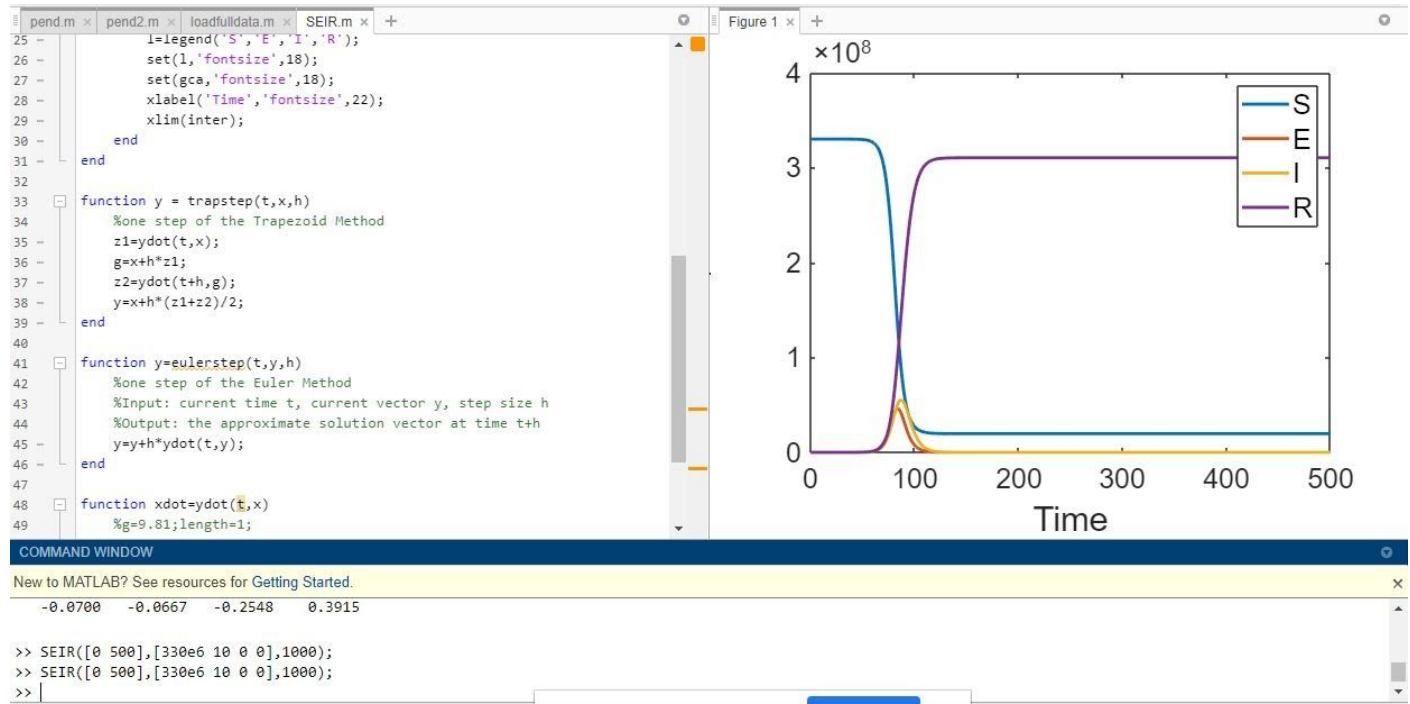
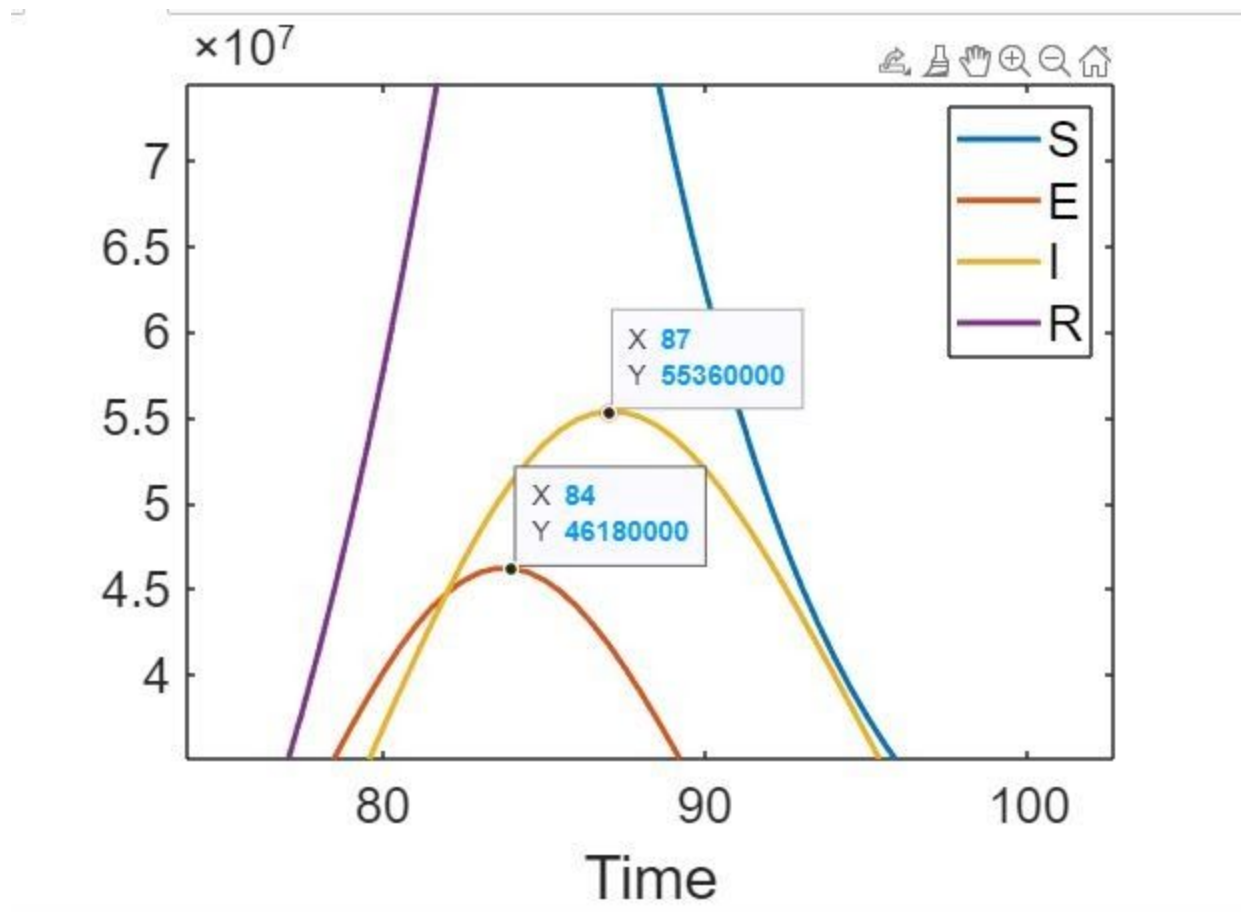


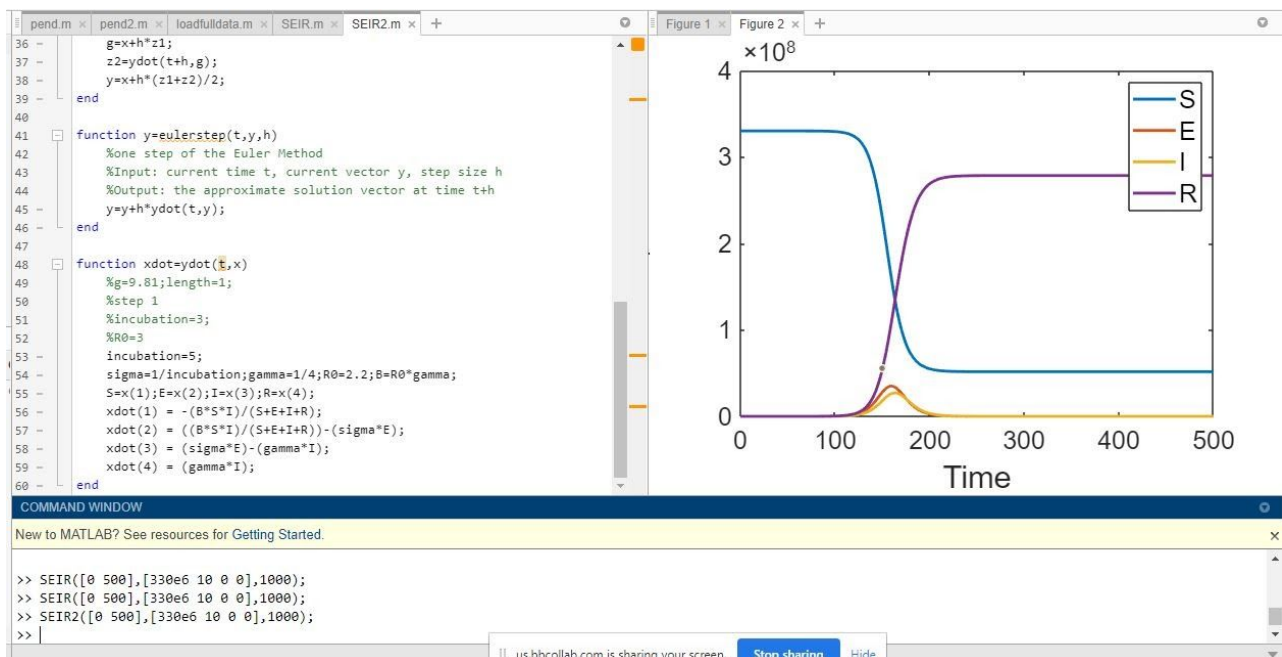
## Project 4

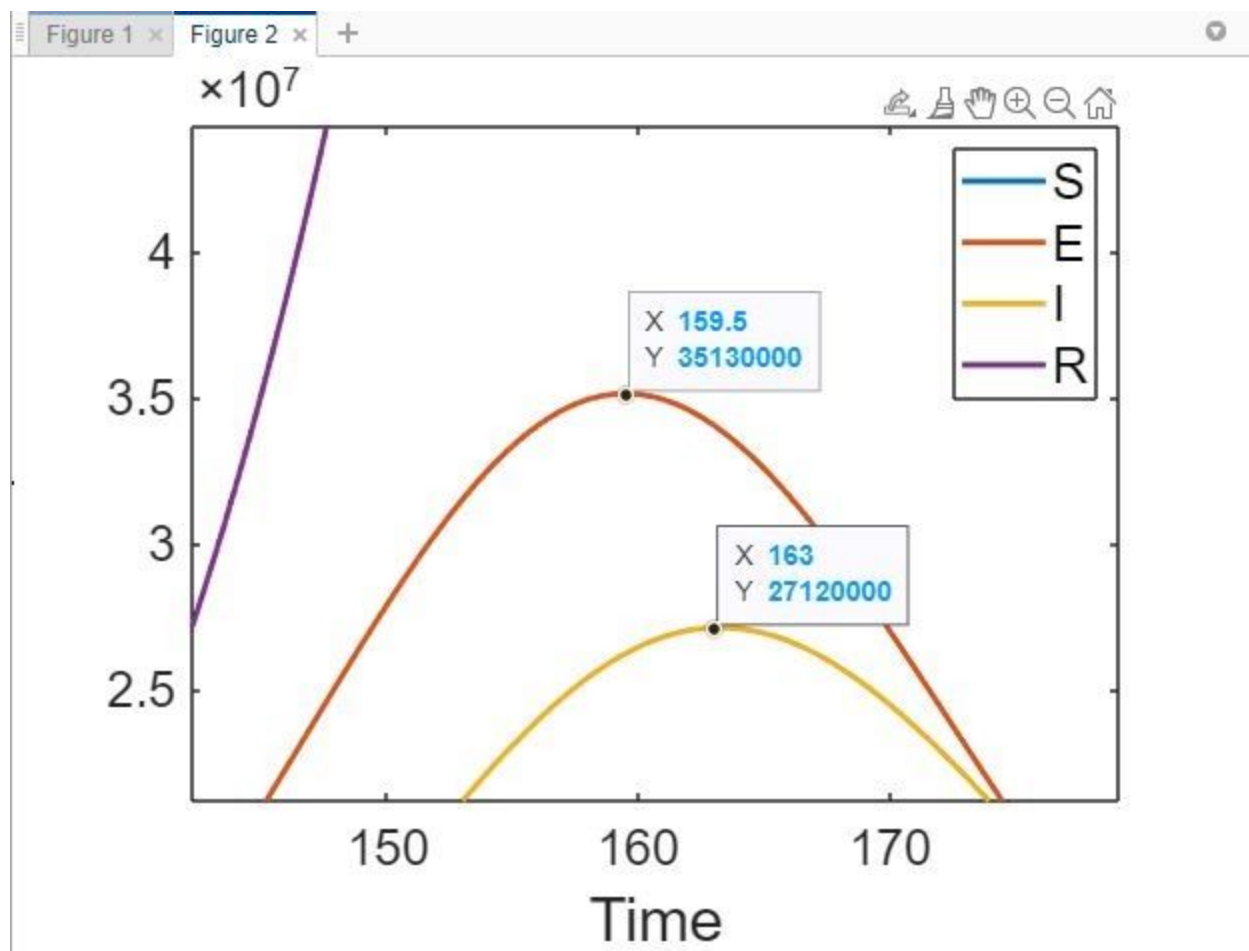
1.



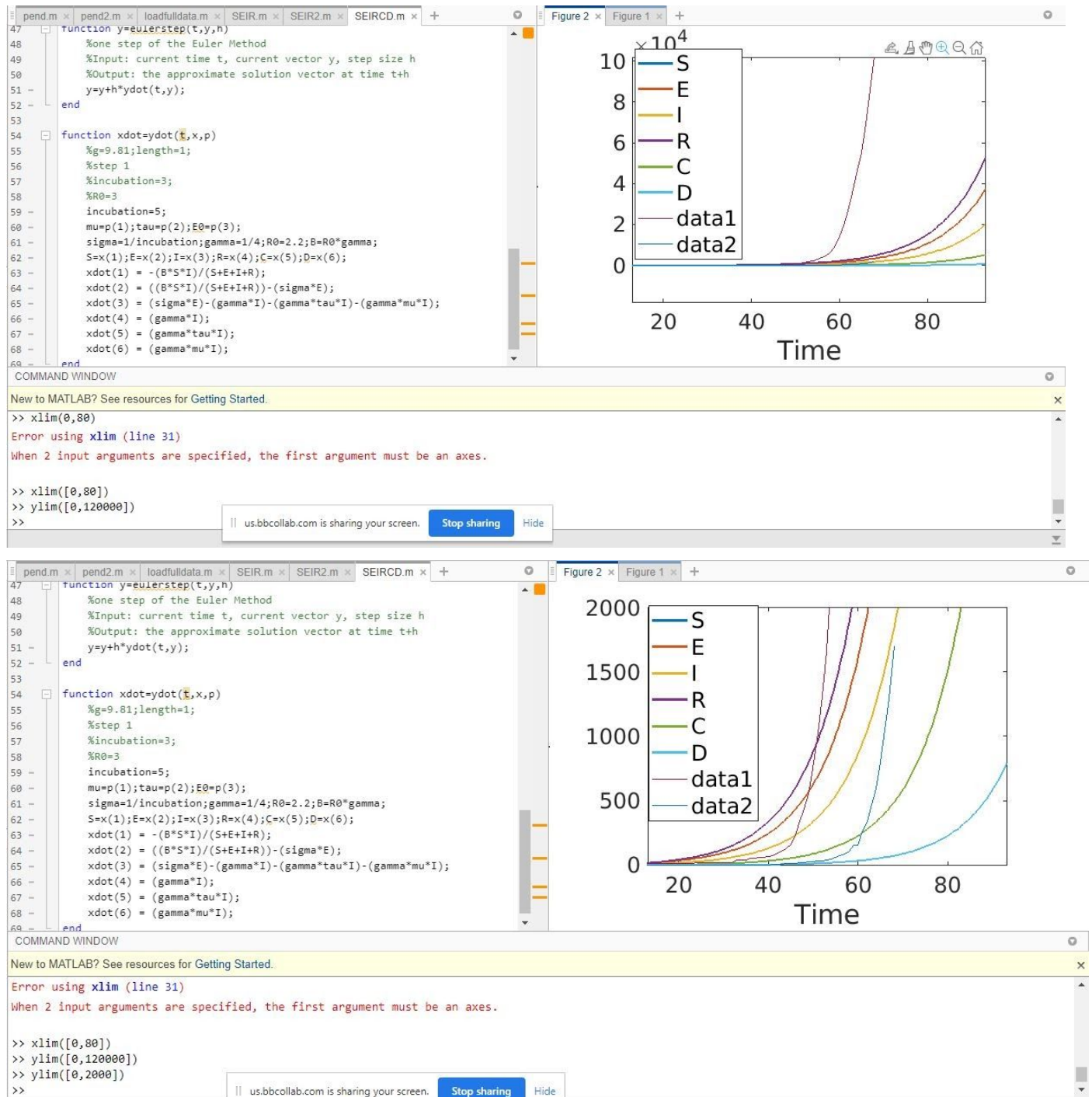


2.  $\sigma=1/5$ ,  $\gamma=1/4$ ,  $R_0=2.2$





3.



Data 1 does not fit C and data 2 does not fit D.

4.

```
SEIRCDerror(Cases,Deaths,[0.015, 0.1, 10])
```

ans =

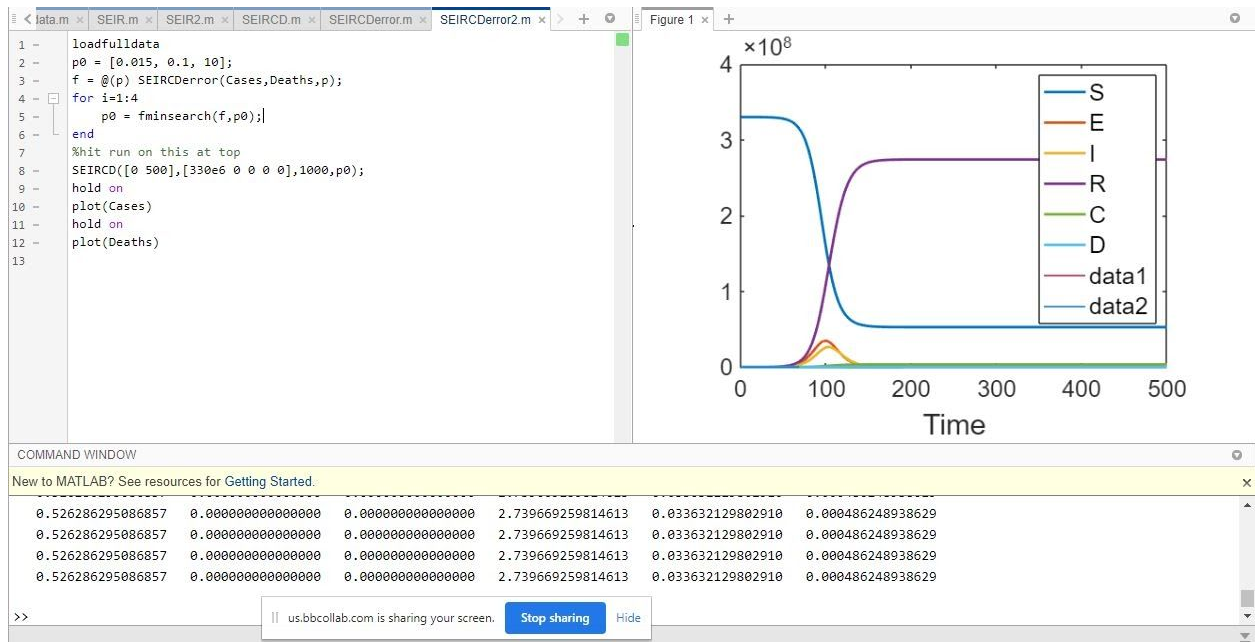
4.529619171647236e+08

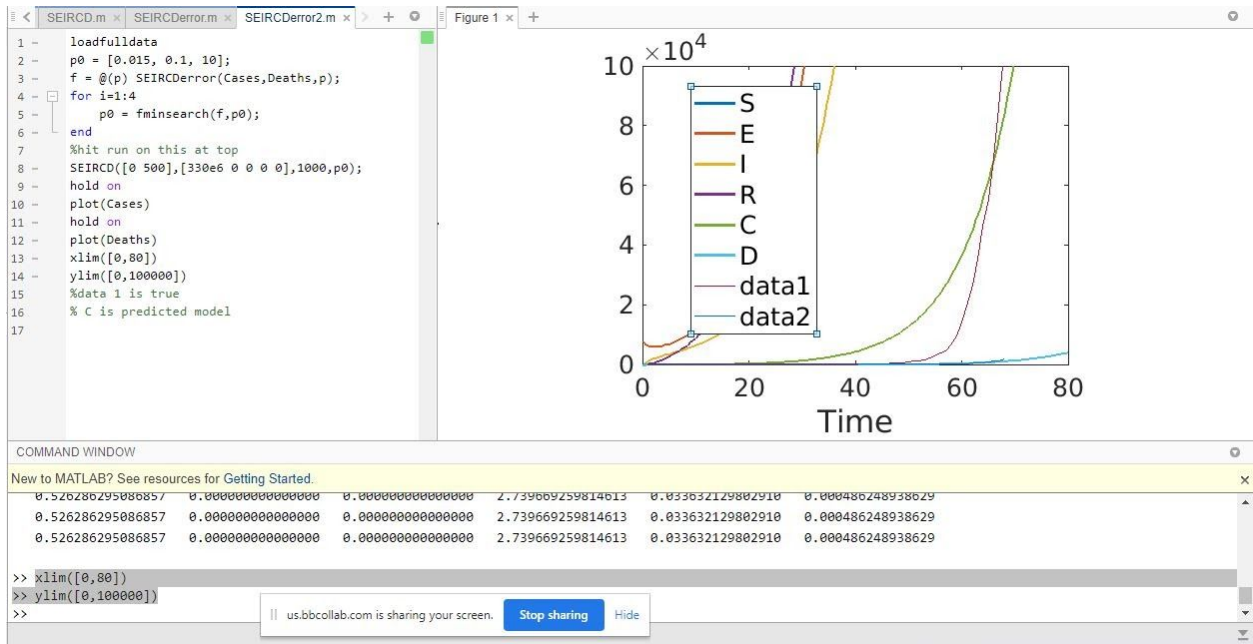
5.

p0 =

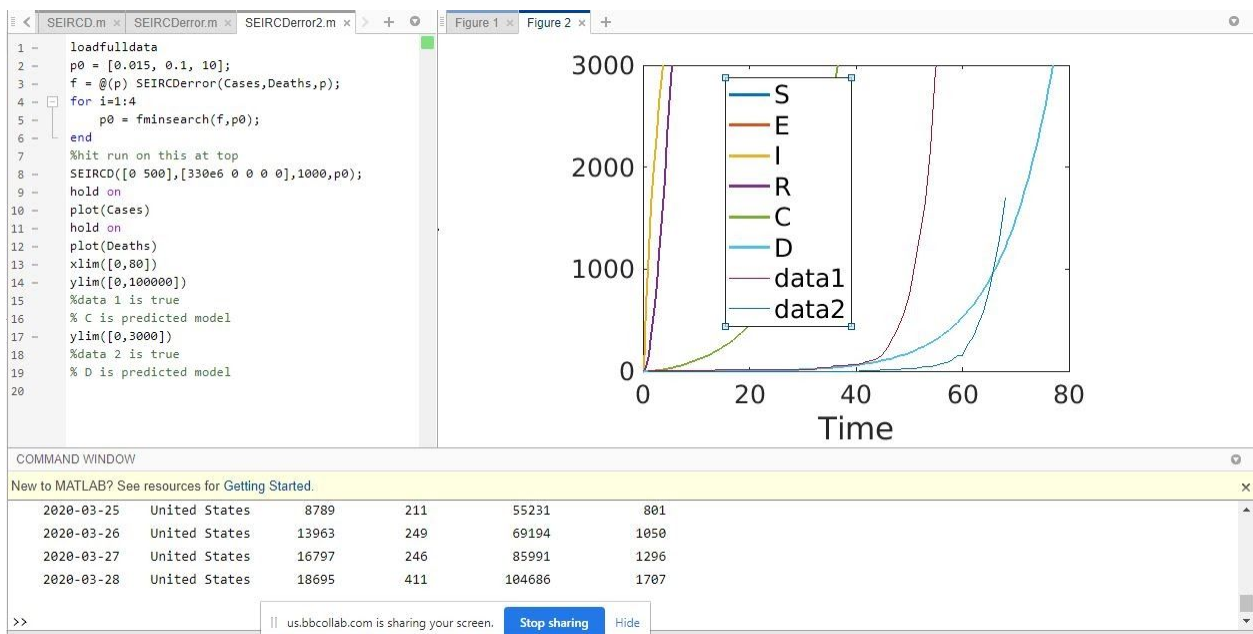
1.0e+03 \*

0.000000177484540    0.000012275981738    7.393364301425547





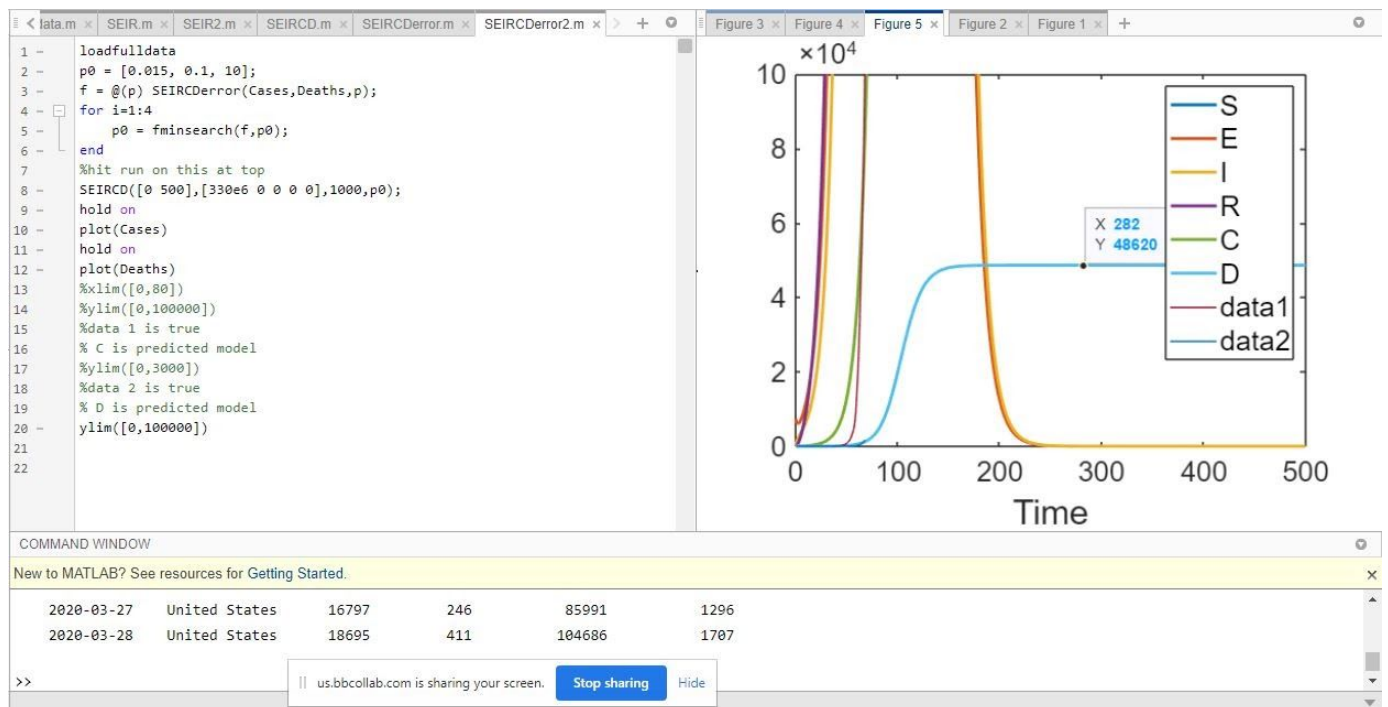
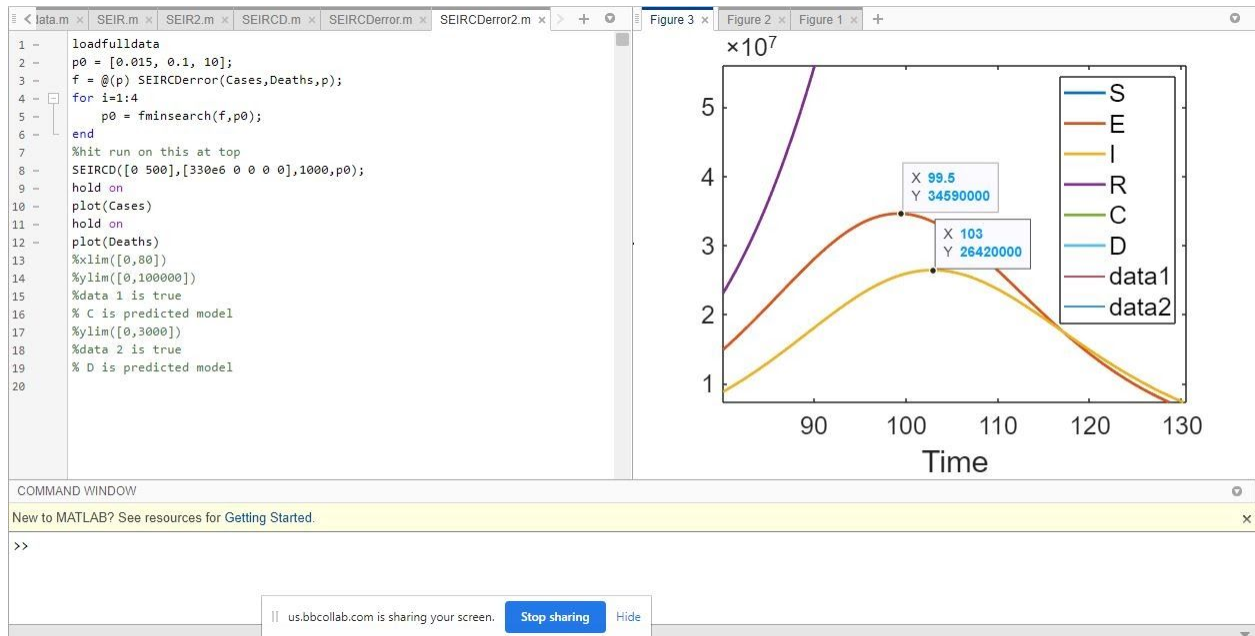
C is predicted model(green) for cases and data1(purple) is actual # of cases



D is predicted model(light blue) for deaths and data2 (dark blue) is actual # of deaths, Data 2 only goes up to certain point & gets cut off.

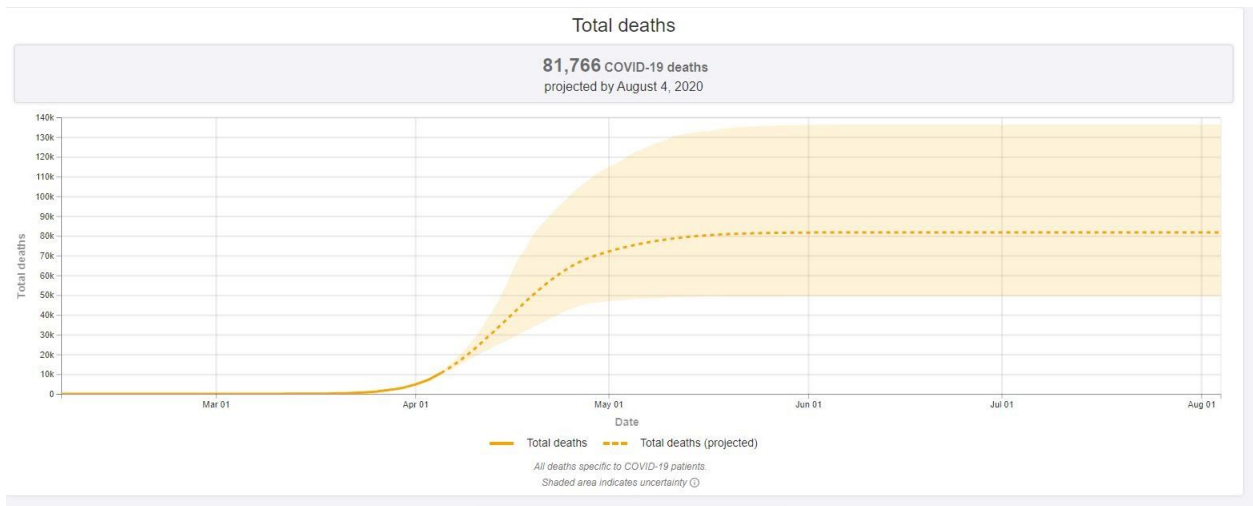
Data 1 fits C better and Data 2 fits D better when compared to number 3.





48620 Deaths (about .025% of US Population).

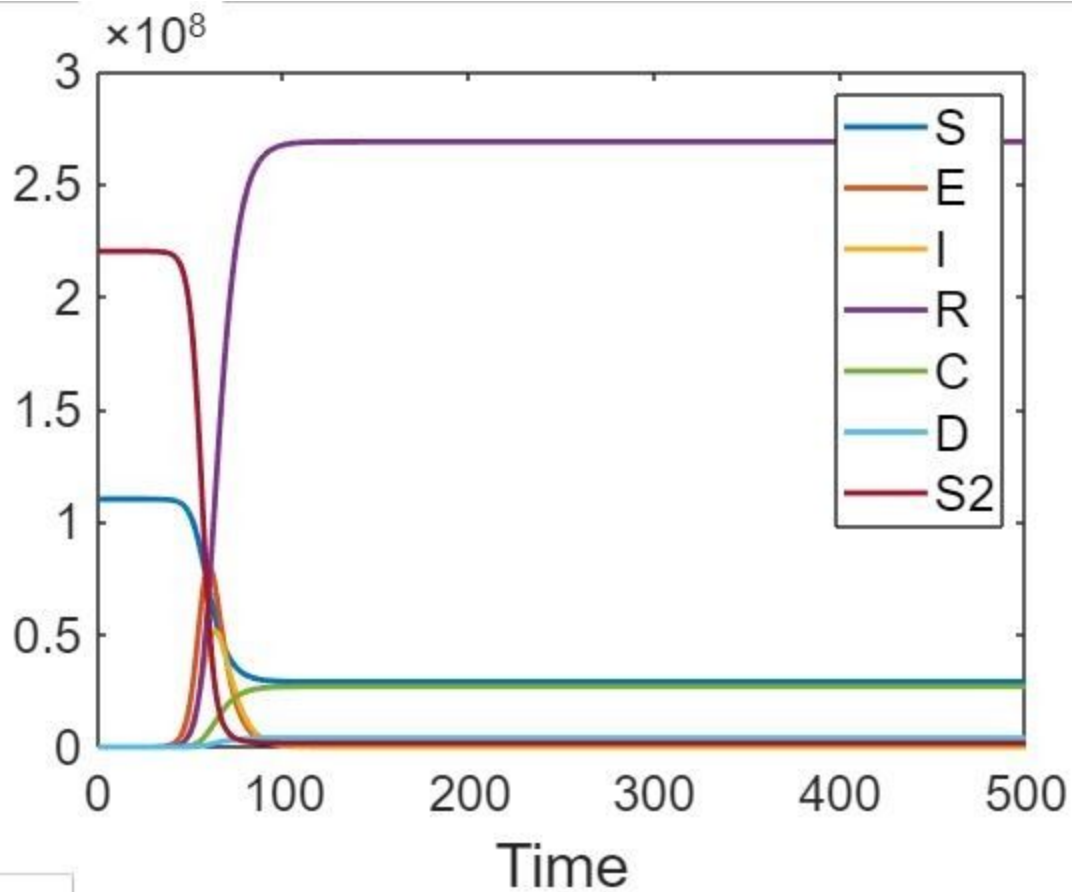
This is what the website looked like



We got 48620 deaths, which is about half of the real data 81,766 deaths.



6.

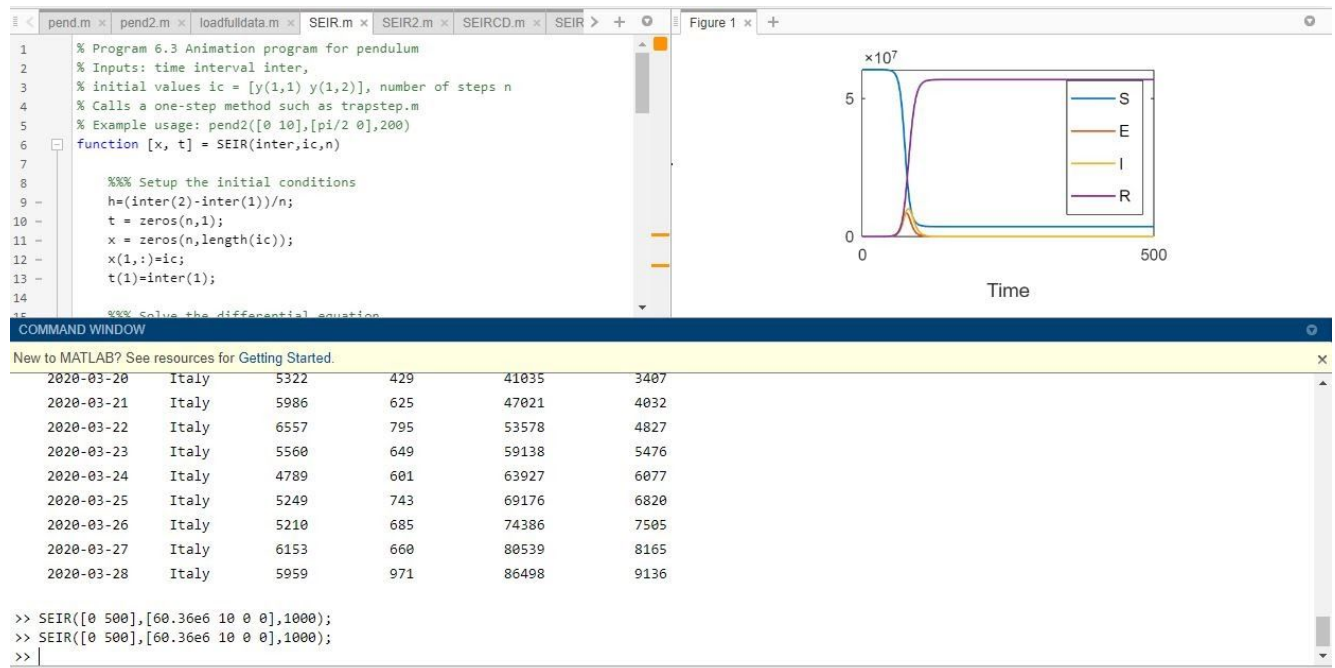


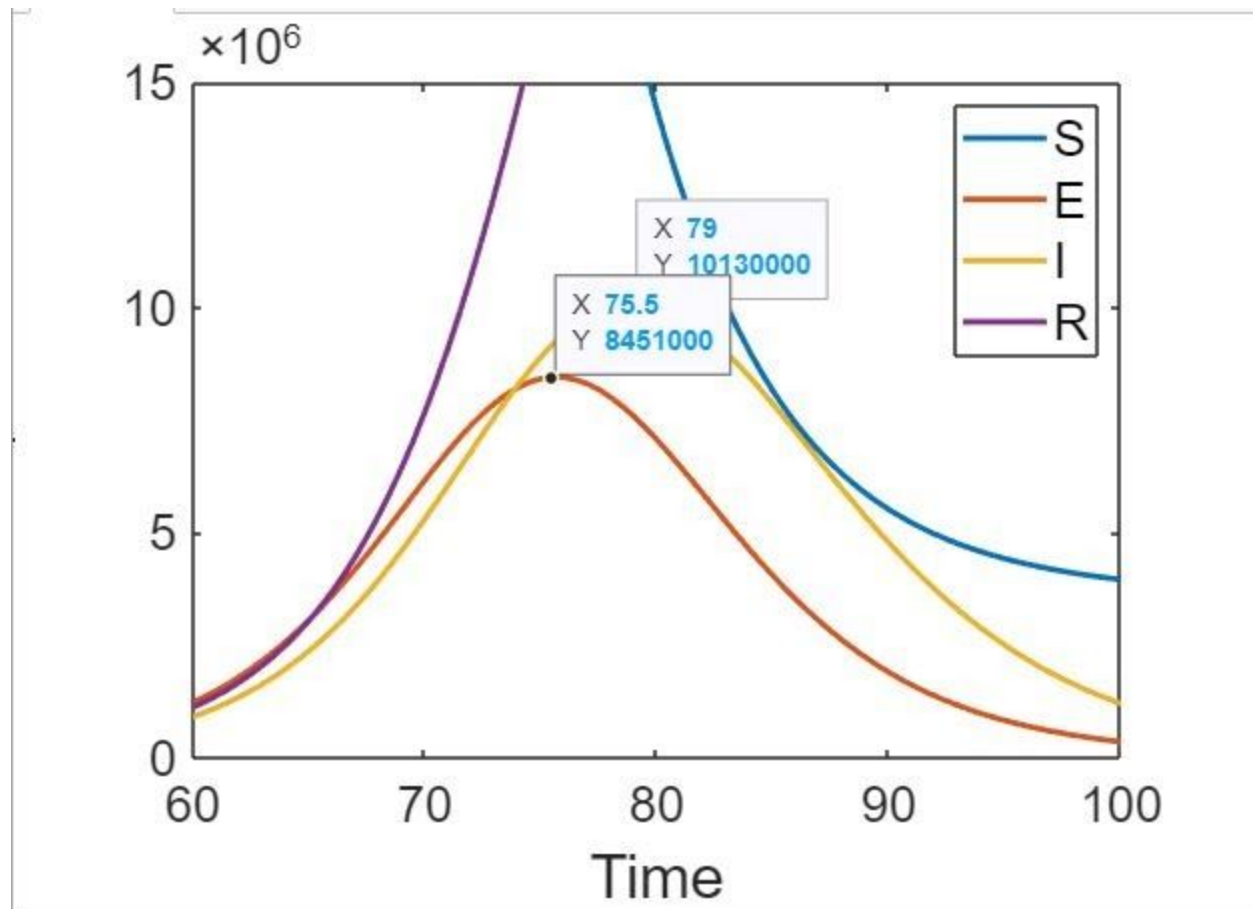
I made 2 plots for the susceptible. Line S represents people who are doing social distancing (dark blue) represents people who are doing social distancing. S2 (brown) represents people who aren't doing social distancing. S2 goes very close to zero because everyone in the S2 line got infected, while the S line levels out at around 0.3, because not everyone in the S line got infected.

7. Population of Italy 60.36 million from

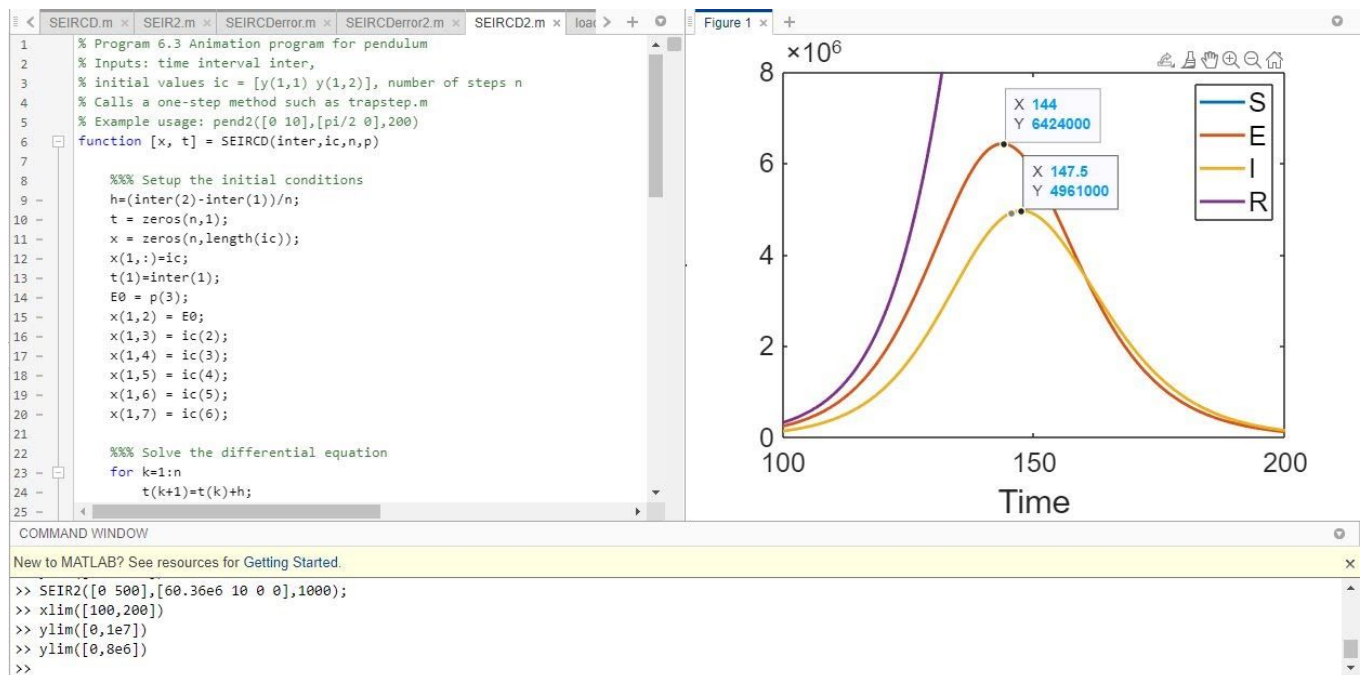
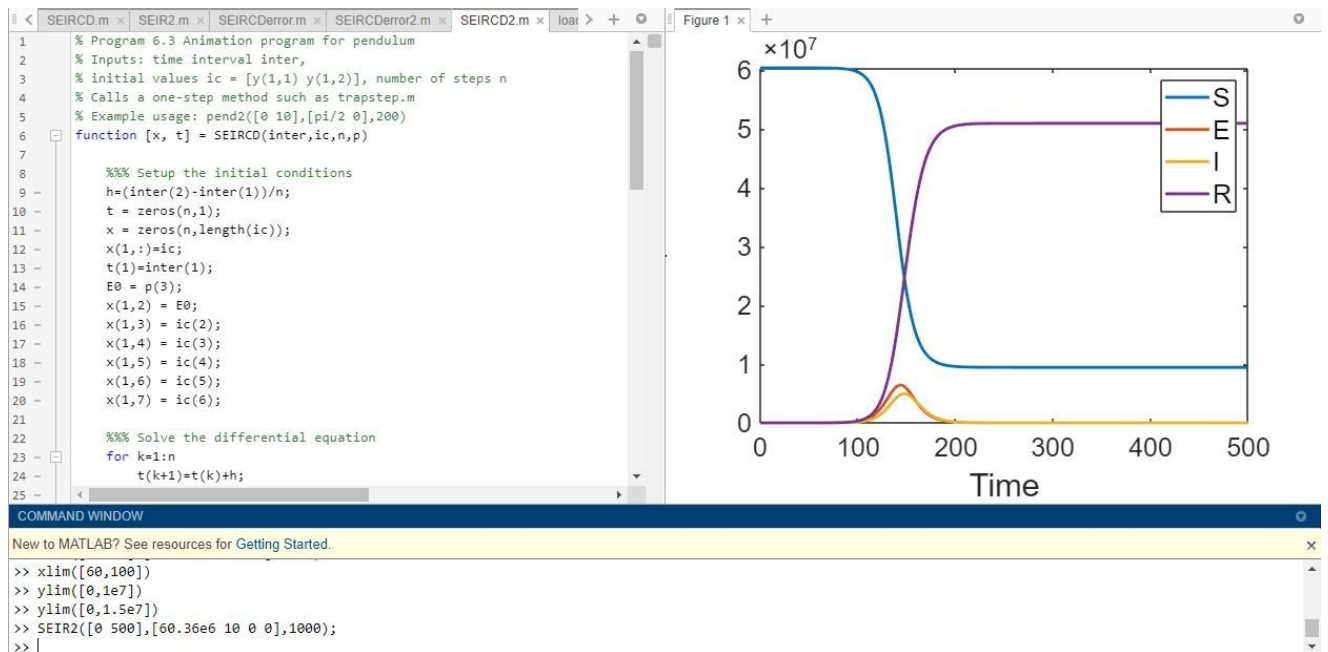
[https://www.google.com/search?q=population+of+italy&rlz=1C1EJFC\\_enUS851US851&oq=population+of+italy&aqs=chrome..69i57j0l7.5391j0j7&sourceid=chrome&ie=UTF-8](https://www.google.com/search?q=population+of+italy&rlz=1C1EJFC_enUS851US851&oq=population+of+italy&aqs=chrome..69i57j0l7.5391j0j7&sourceid=chrome&ie=UTF-8)

7-1

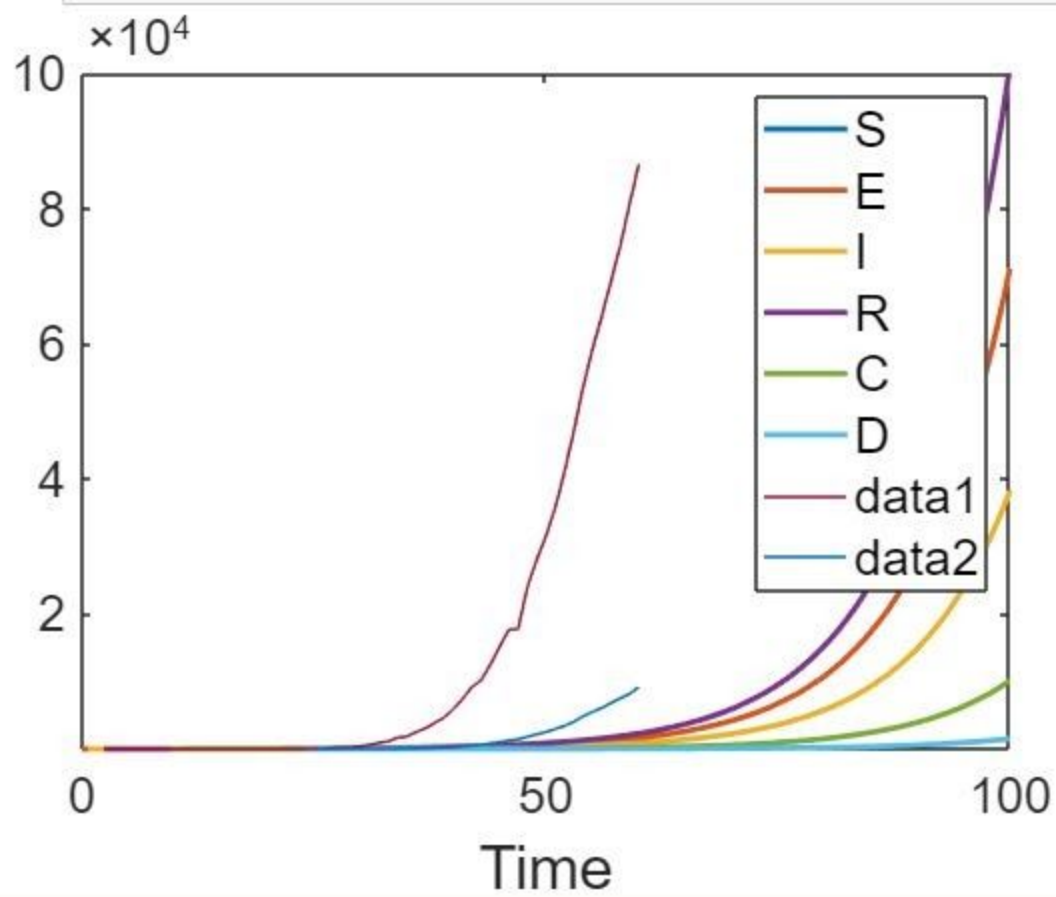




7-2  $\sigma=1/5$ ,  $\gamma=1/4$ ,  $R_0=2.2$



7-3



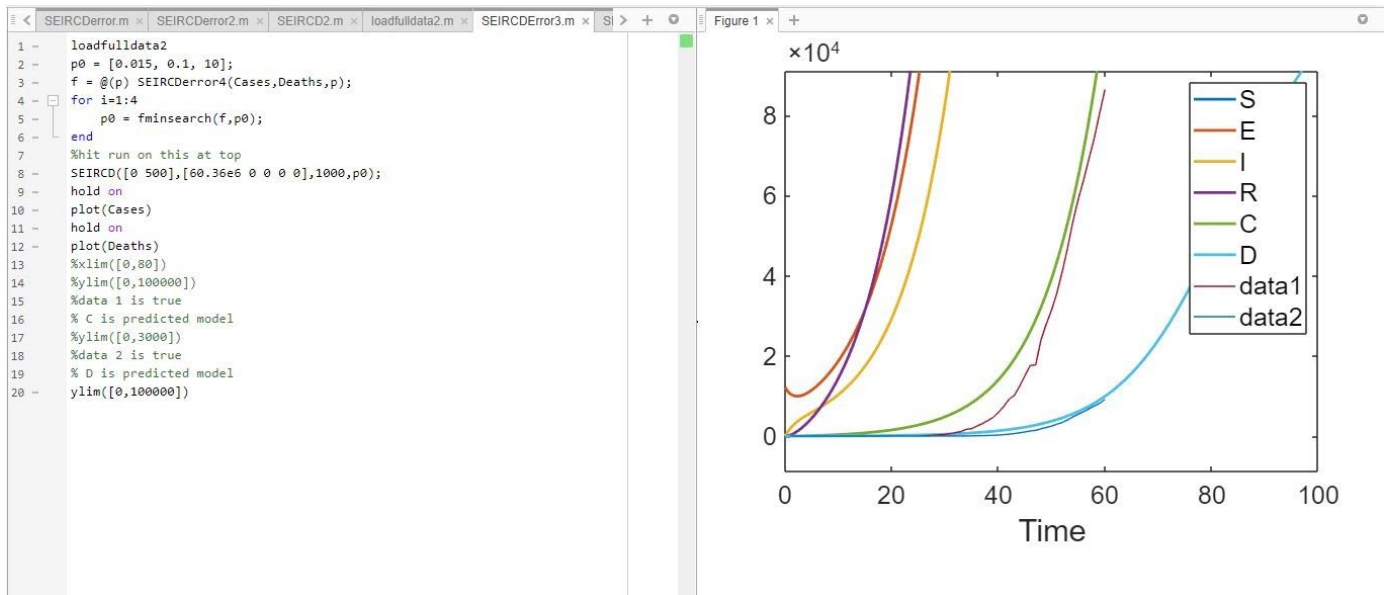
Data 1 should match the cases and data 2 should match the deaths, but it doesn't

7-4 `SEIRCDerror4(Cases,Deaths,[0.015, 0.1, 10])`

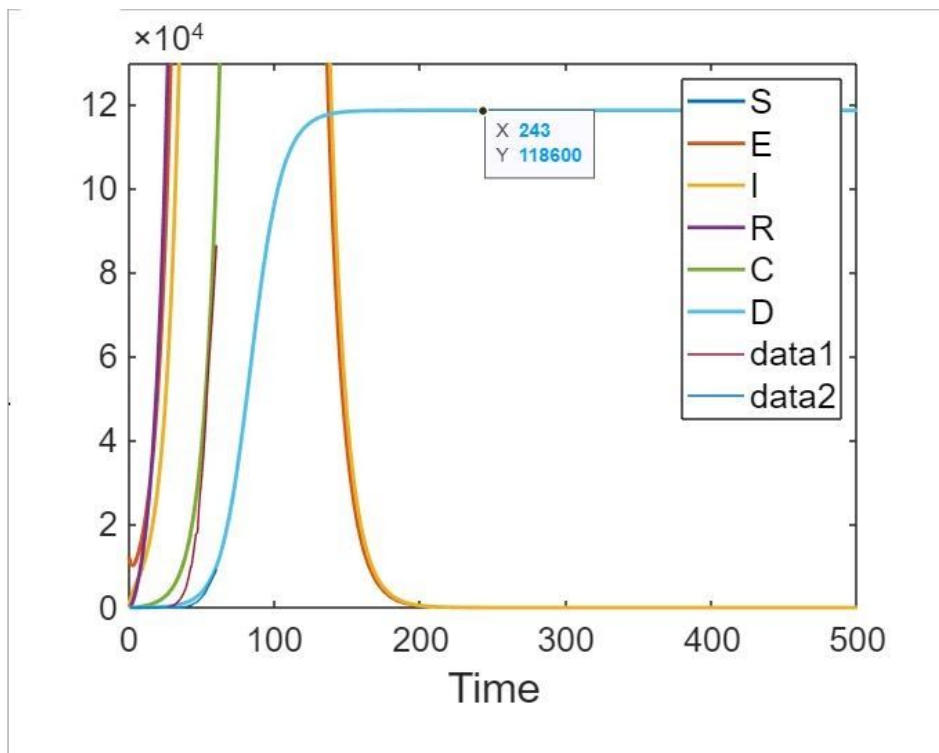
ans =

7.5682e+08

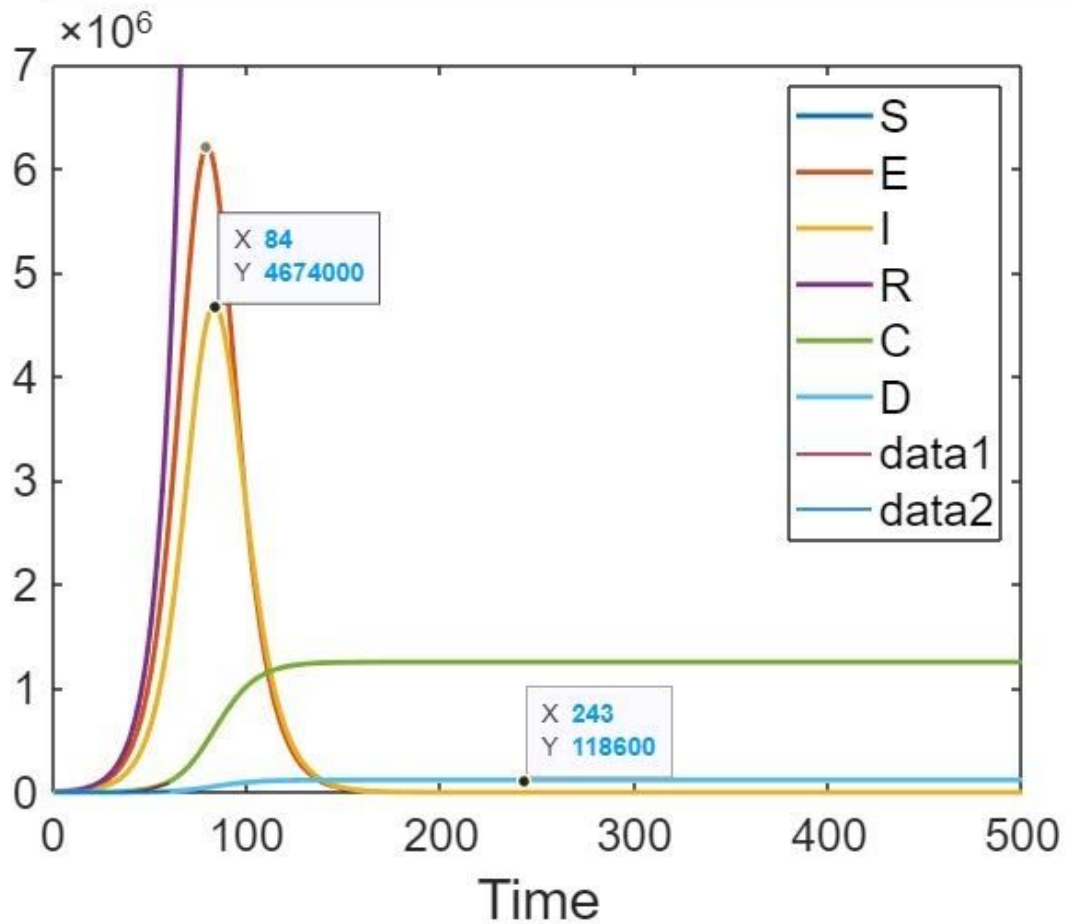
7-5



As you can see the data fits a lot better, data 1(purple) fits the Cases(green) better and data 2(dark blue) fits the Deaths(light blue) better. If you notice, S2 gets cut off.

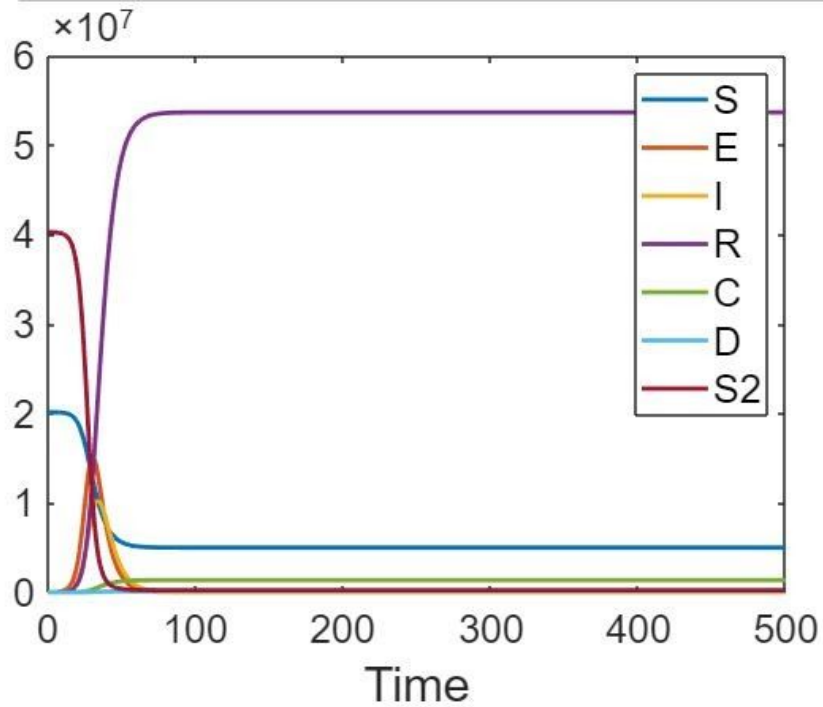


The max deaths is 118600 (.2% of Italy population).



21,130 deaths predicted for Italy, which is much smaller than 118,600.





I made 2 plots for the susceptible. Line S represents people who are doing social distancing (dark blue) represents people who are doing social distancing. S2 (brown) represents people who aren't doing social distancing. S2 goes very close to zero because almost everyone in the S2 line got infected, while the S line levels out at around  $0.5 \times 10^7$ , because not everyone in the S line got infected.

```
SEIRCD2([0 500], [20.12e6 0 0 0 0 40.24e6], 1000, p0)
```

p0 =

1.0e+04 \*

0.0000 0.0000 1.2151

(after fminsearch)

