ELEC 4700

Assignment 2

Finite Difference Method

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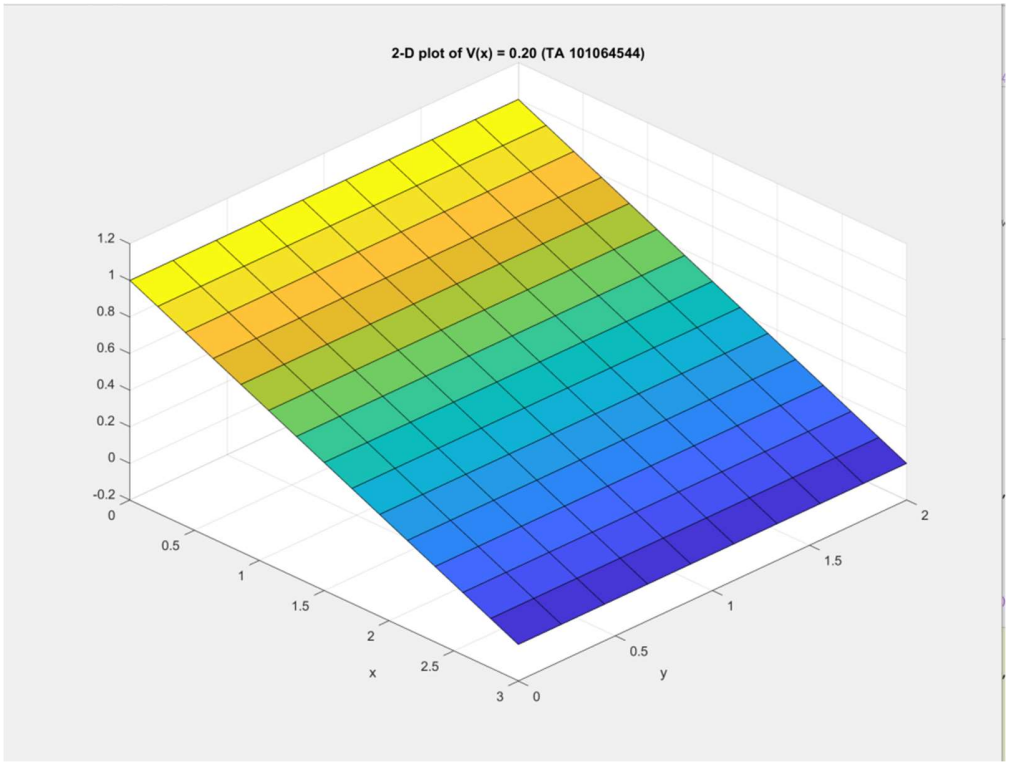
Question 1 the electrostatic potential in the rectangular region

Using the Finite Difference Method

a)



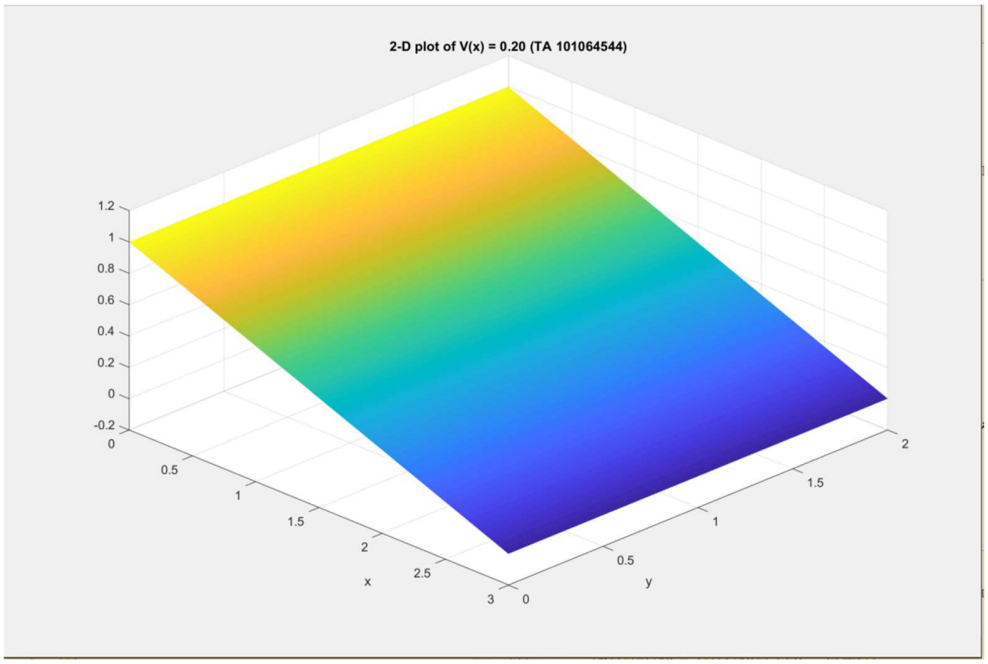
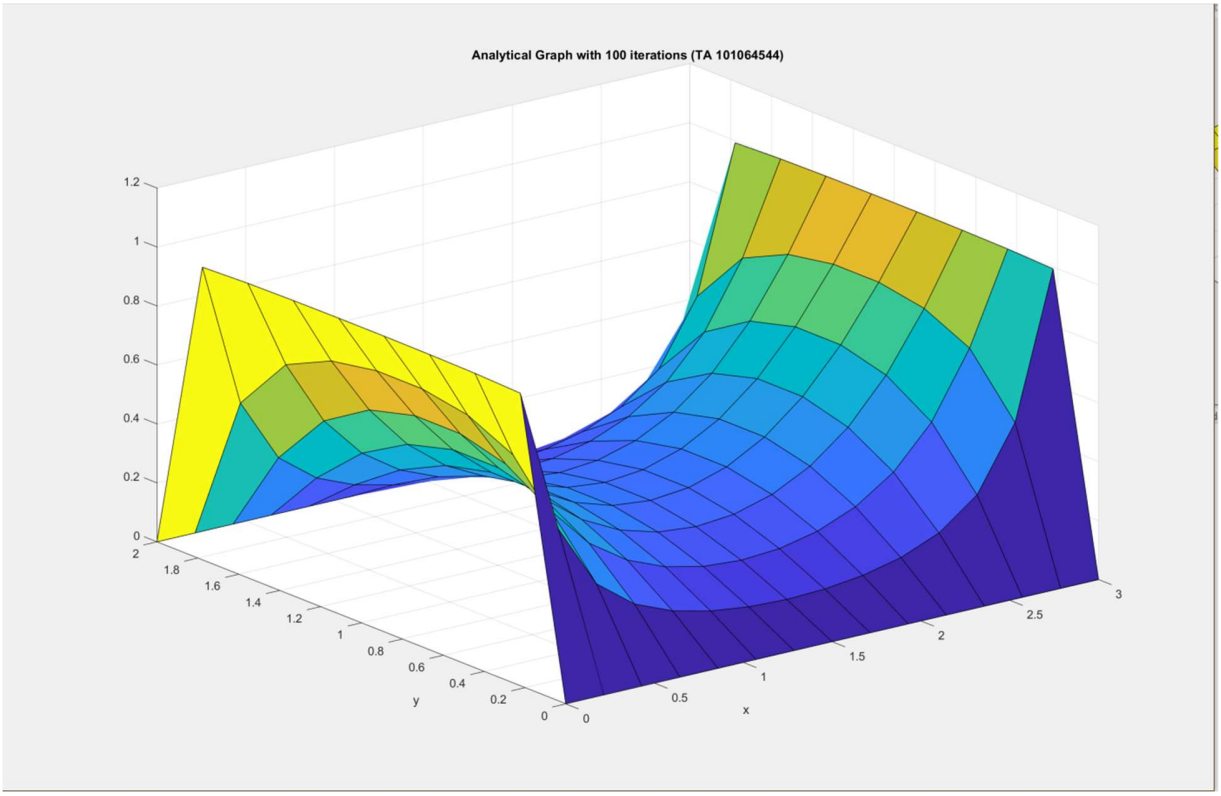


Figure 1: 2-D plot of V (x)

b)



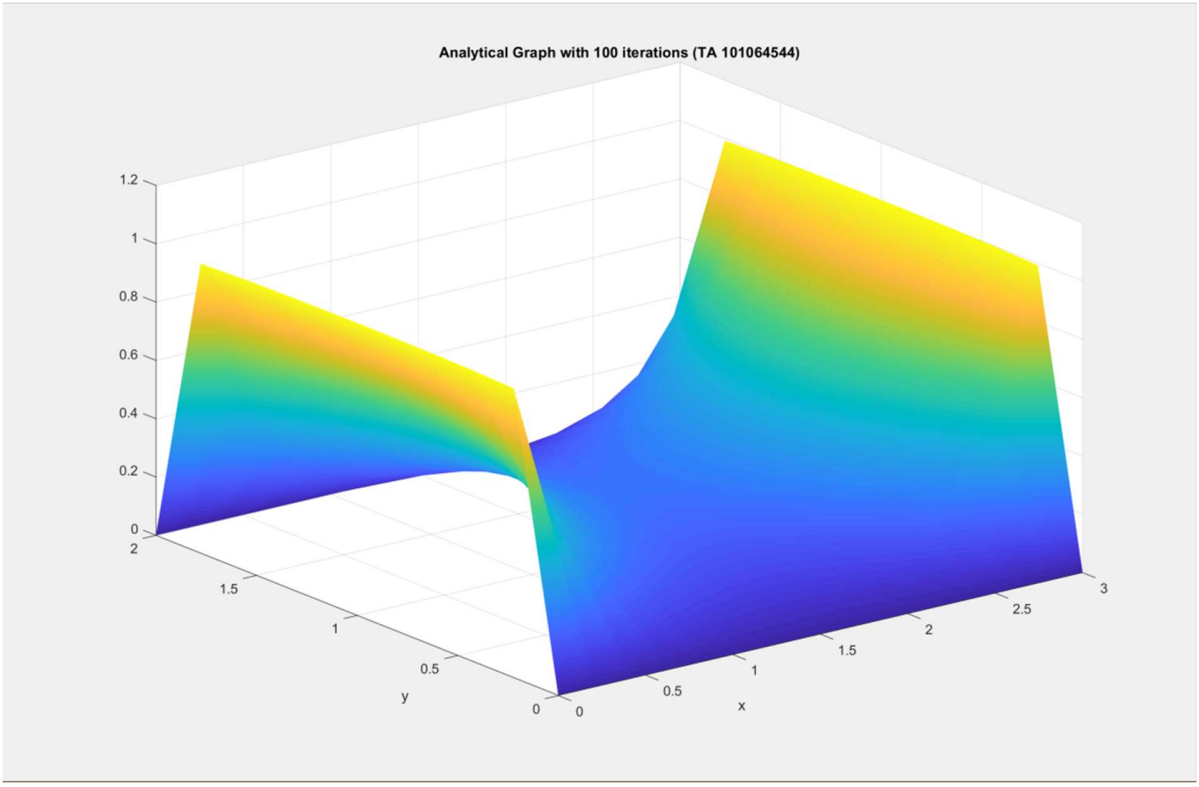


Figure 2: Matching surface plots of V (x, y)

As shown in figure 2, there seems to be an error with the Y bounds. As the solution is completed and the full solution is achieved, it is observed that it slows down and then converges really fast. This can be a reason to conclude that the speed is inversely proportional to the accuracy.

Question 2 the current flow in the rectangular region

Use the Finite Difference Method

a)

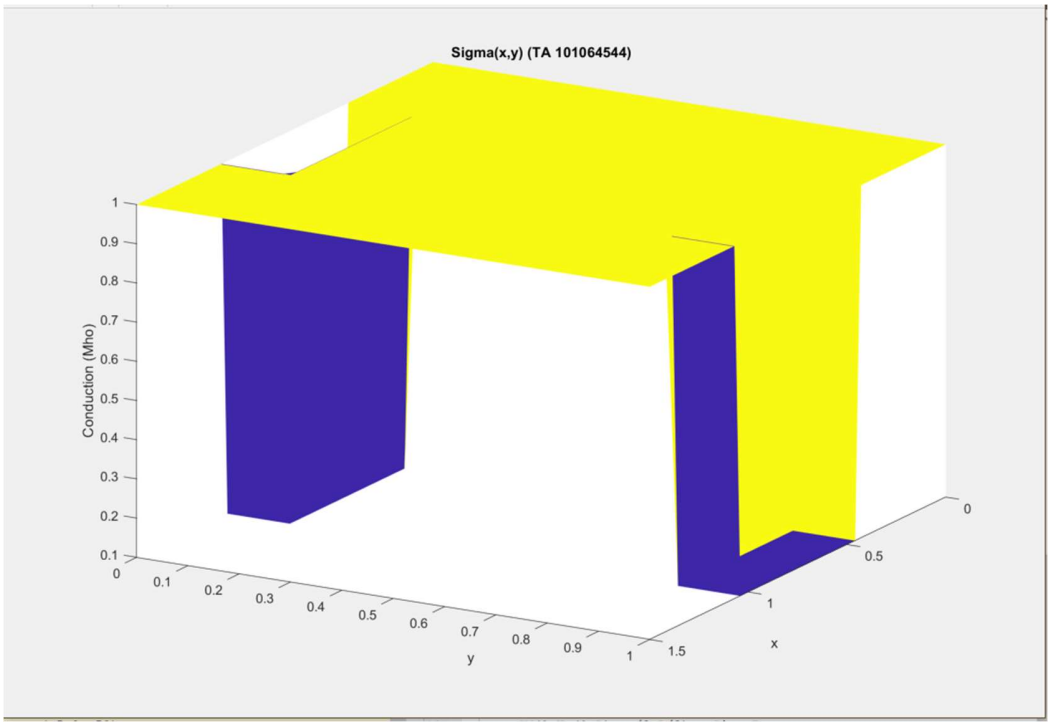


Figure 3: current σ (x, y)

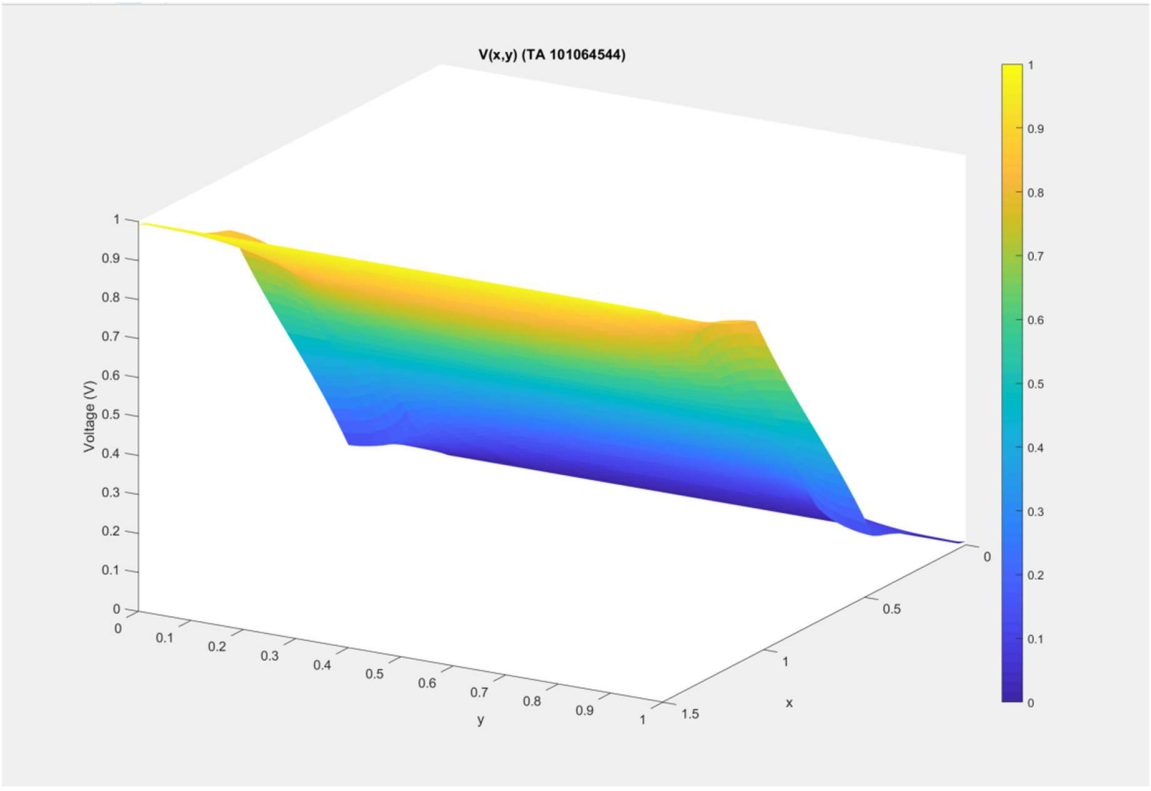


Figure 4: current V (x, y)

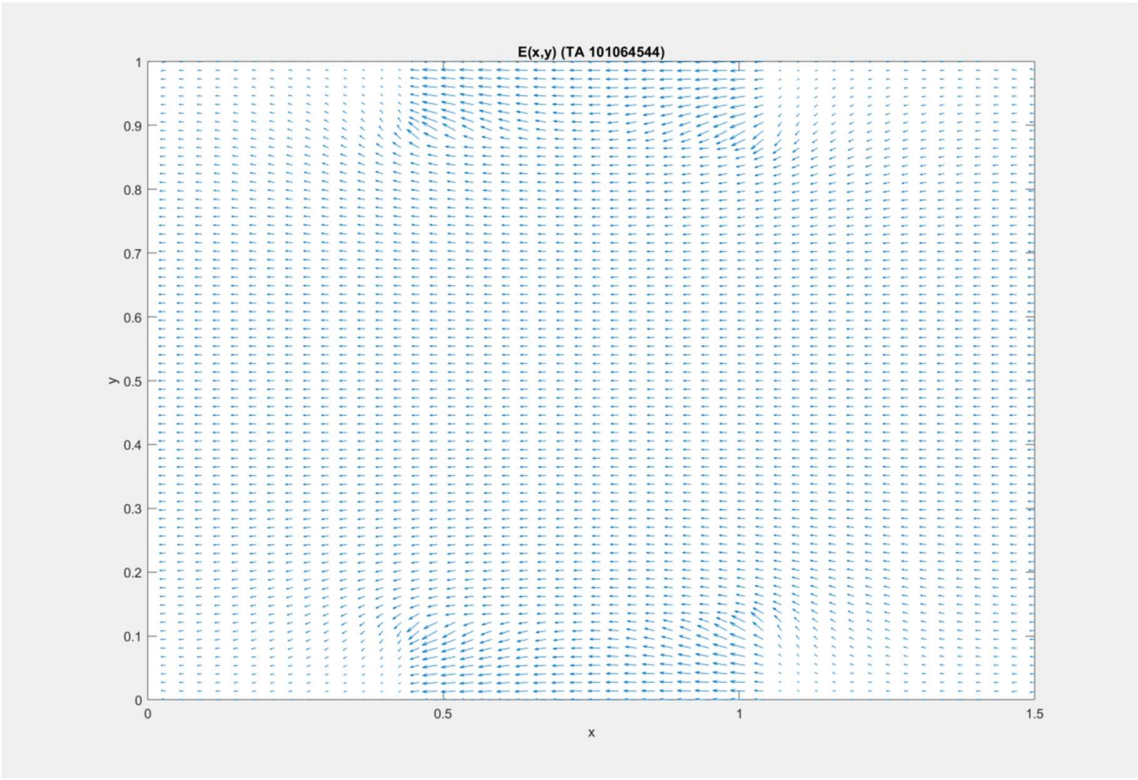


Figure 5: current E (x, y)

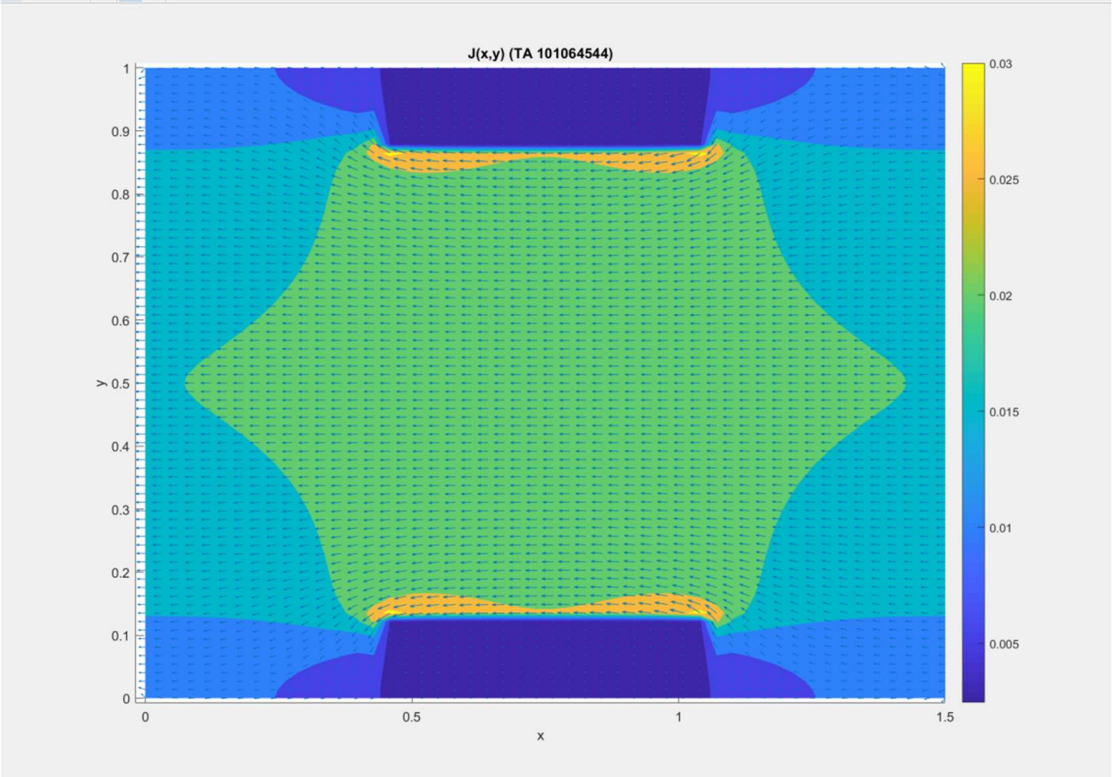


Figure 6: current J (x, y)

(b)

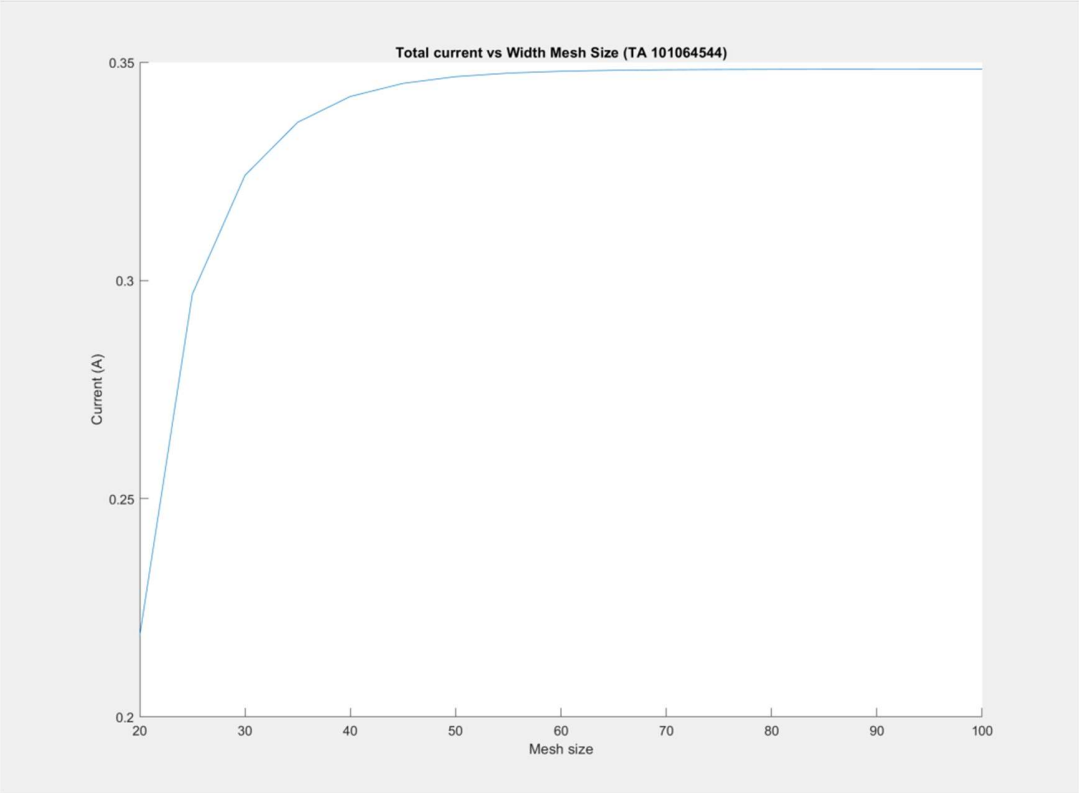


Figure 7: Graph of current vs mesh size

(c)

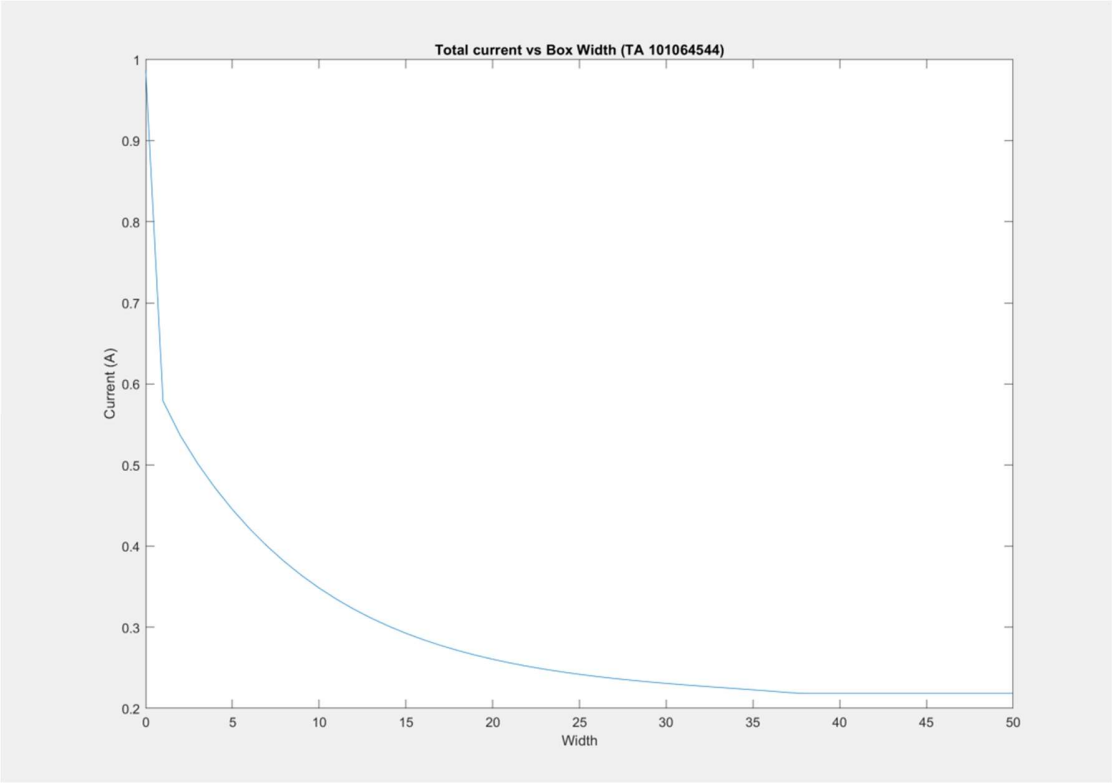


Figure 8: Graph of current vs various bottle-necks

(d)

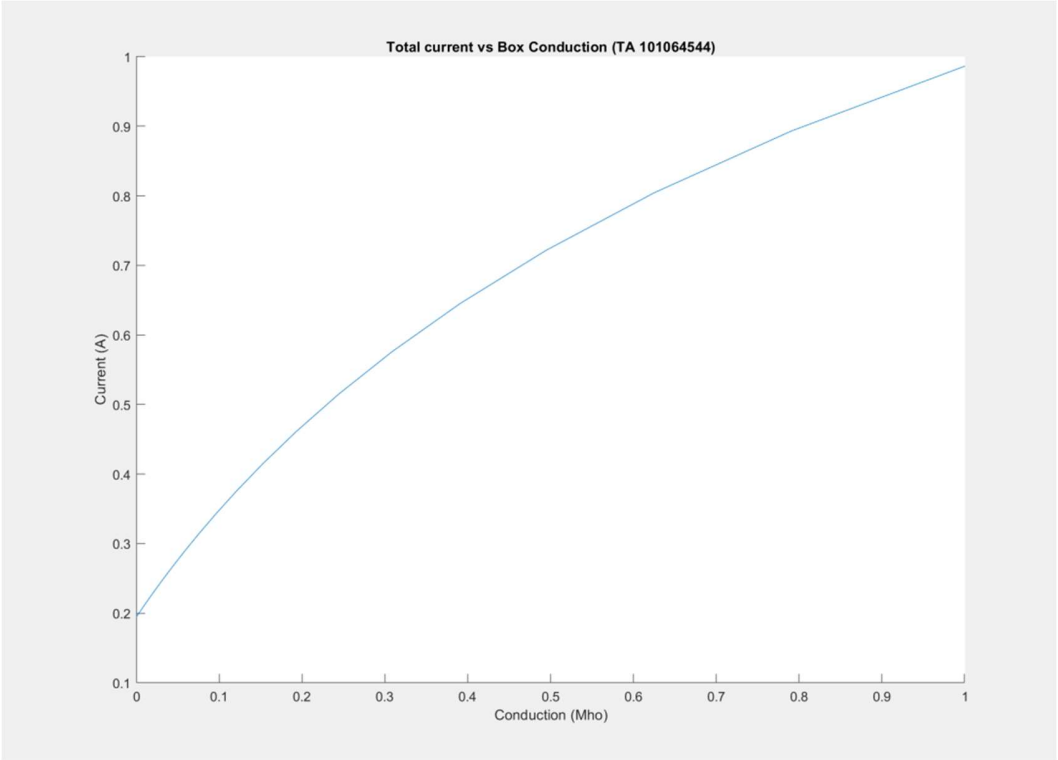


Figure 9: Graph of current vs σ