

# **ELEC 4700 Assignment 2**

**Finite Difference Method**

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# Chapter 1. Analytical versus Numerical Solutions

a)

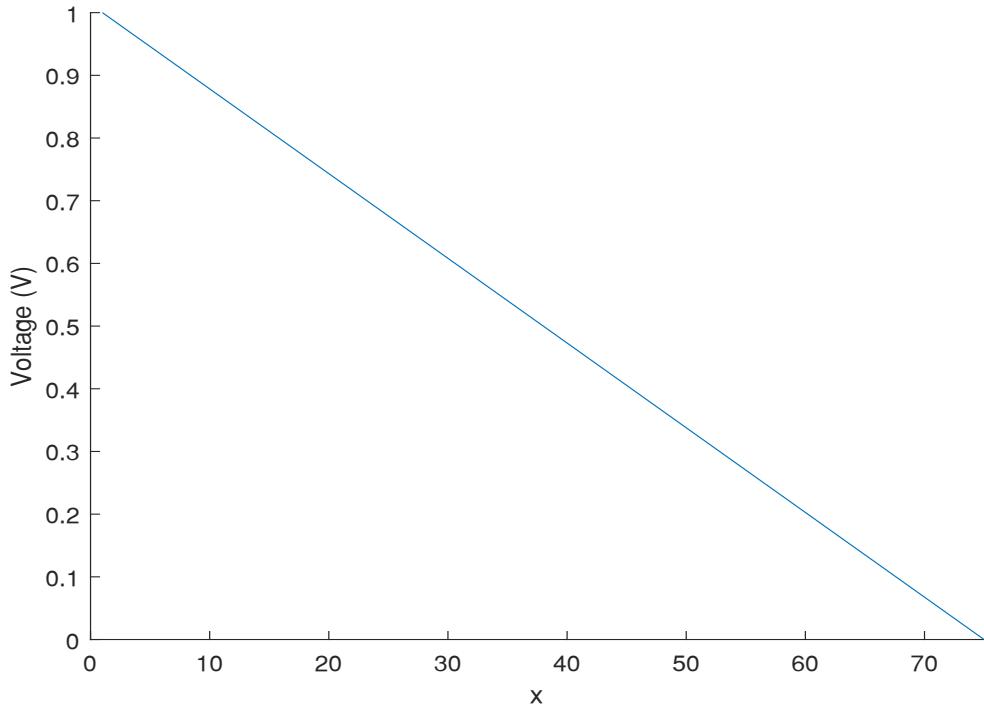


Figure 1.1. 2-D plot of  $V(x)$

b)

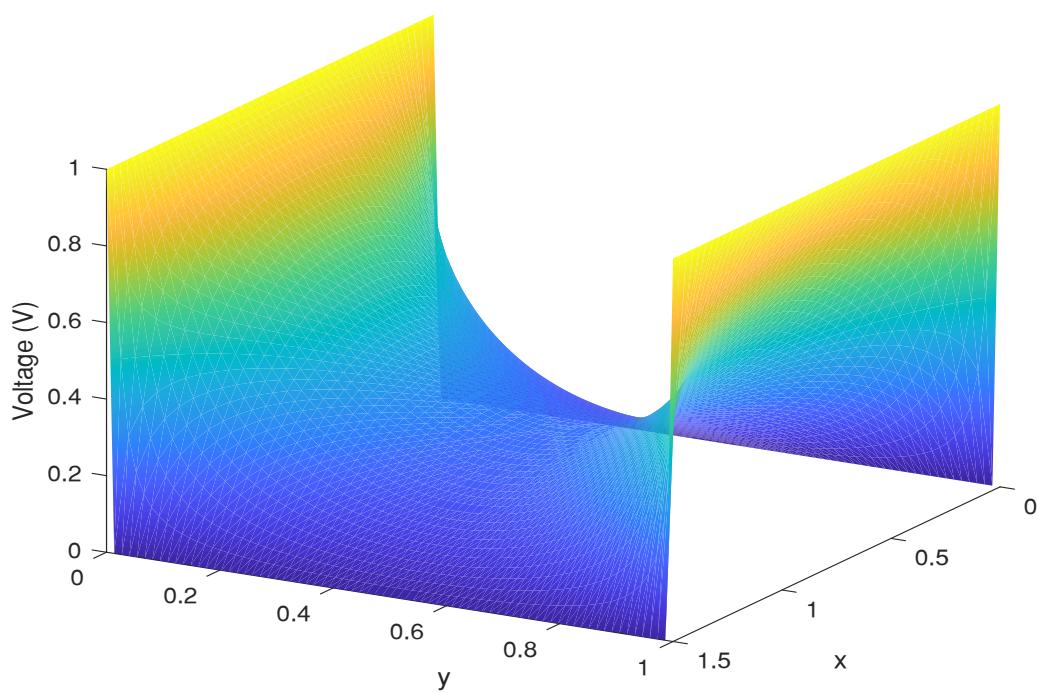


Figure 1.2. Surface Plot of  $V(x,y)$  - Numeric Solution

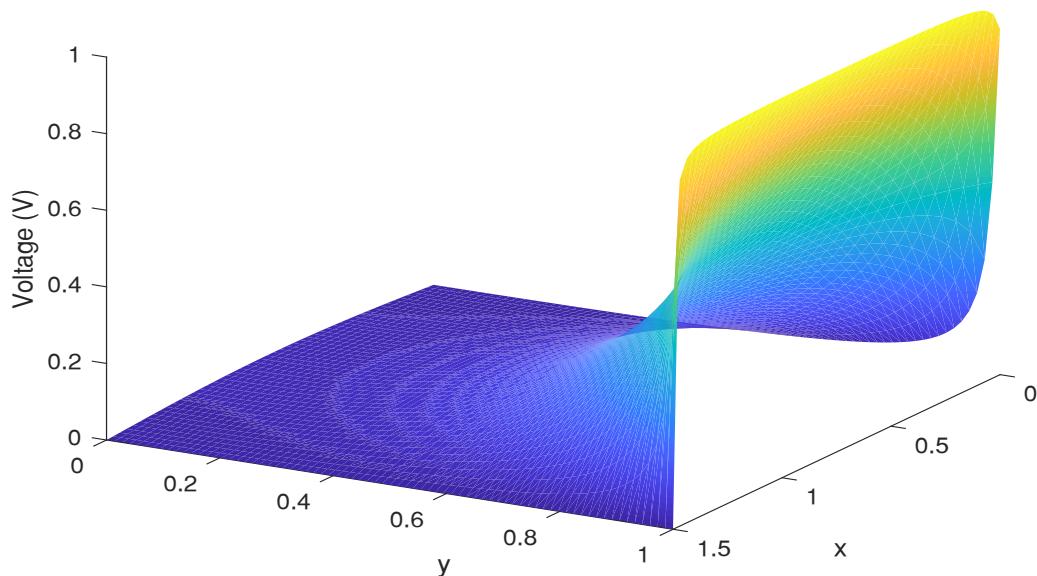


Figure 1.3. Surface Plot of  $V(x,y)$  - Analytic Solution

When Compared, the numerical and analytical, the analytical solution is less computationally difficult, however there is great difficulty in deciding on the number of iterations to perform of the infinite series. This is problematic as the series does not converge nicely. In this case, the two solutions are very different. In addition, the analytical solution becomes impractical for complex geometry.

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# Chapter 2. Analysis of Current Bottleneck

a)

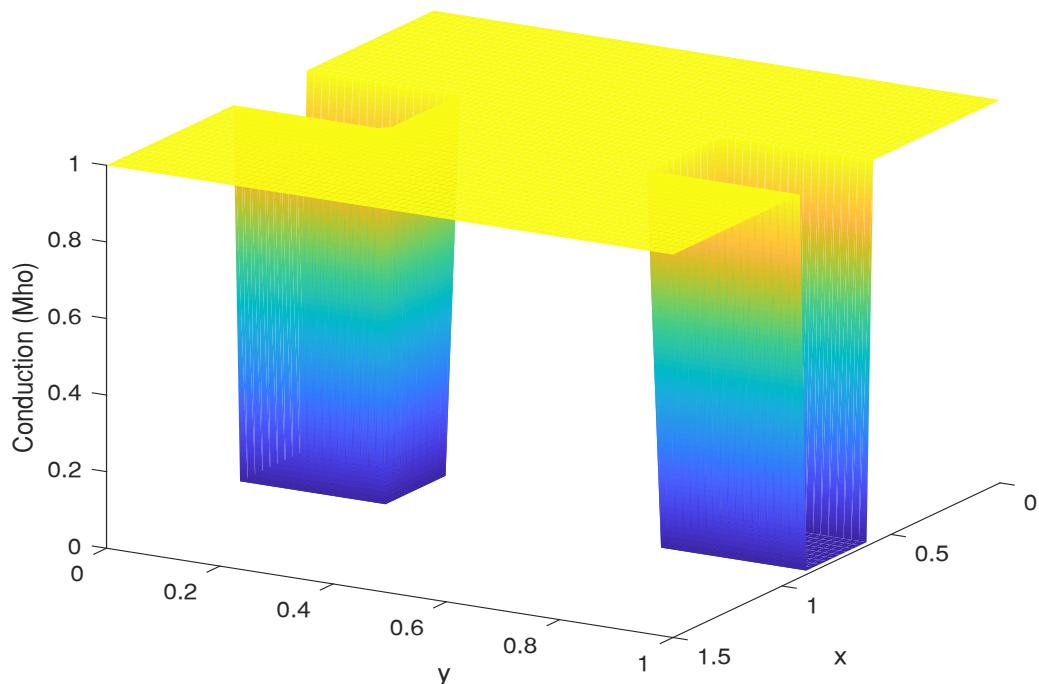


Figure 2.1. Sheet Resistance Plot

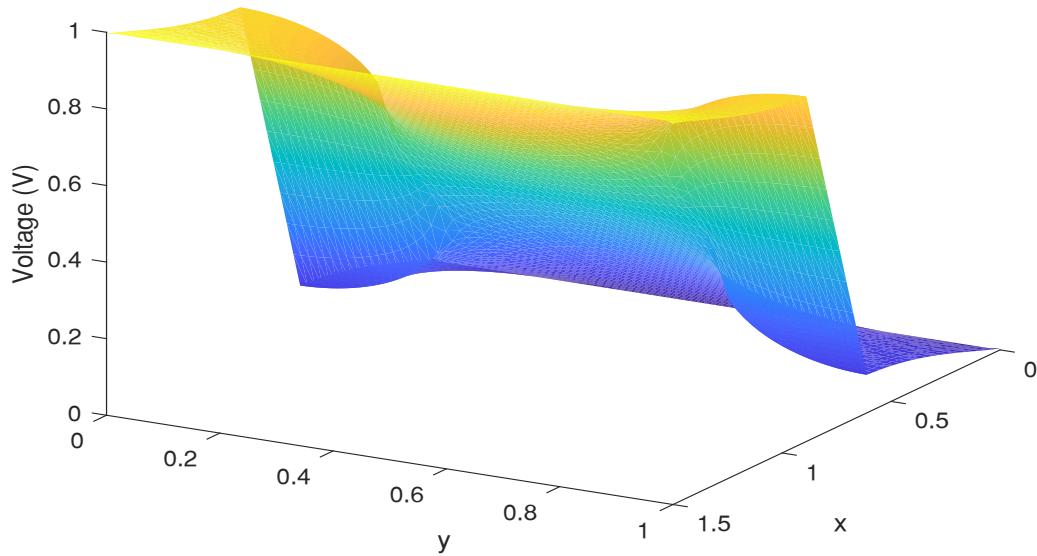


Figure 2.2. Voltage Plot

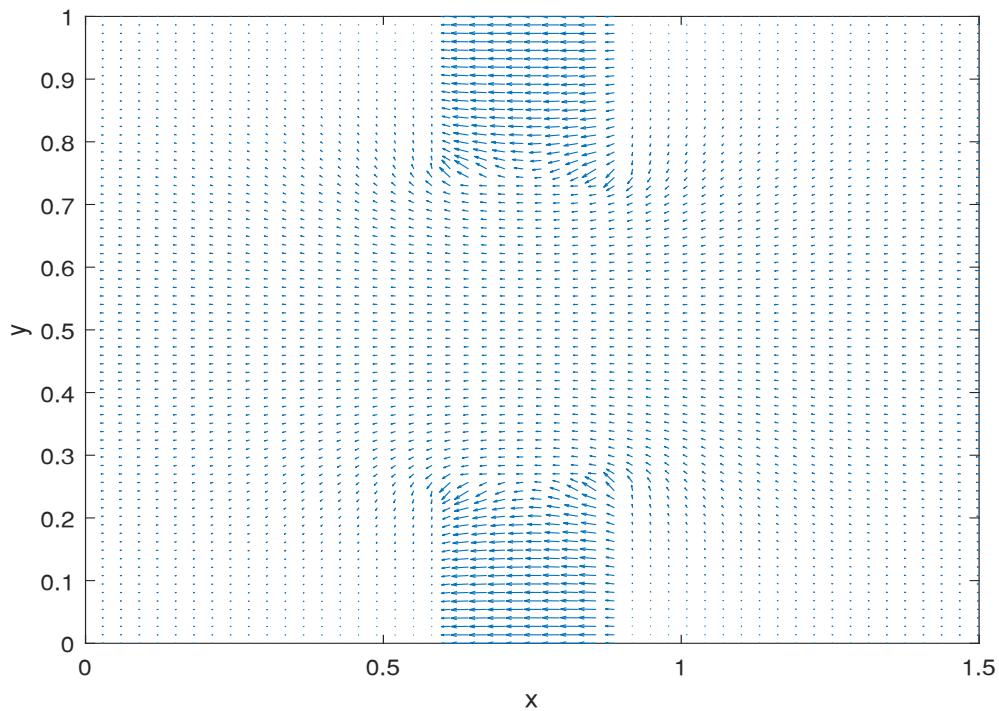


Figure 2.3. Electric Field Plot

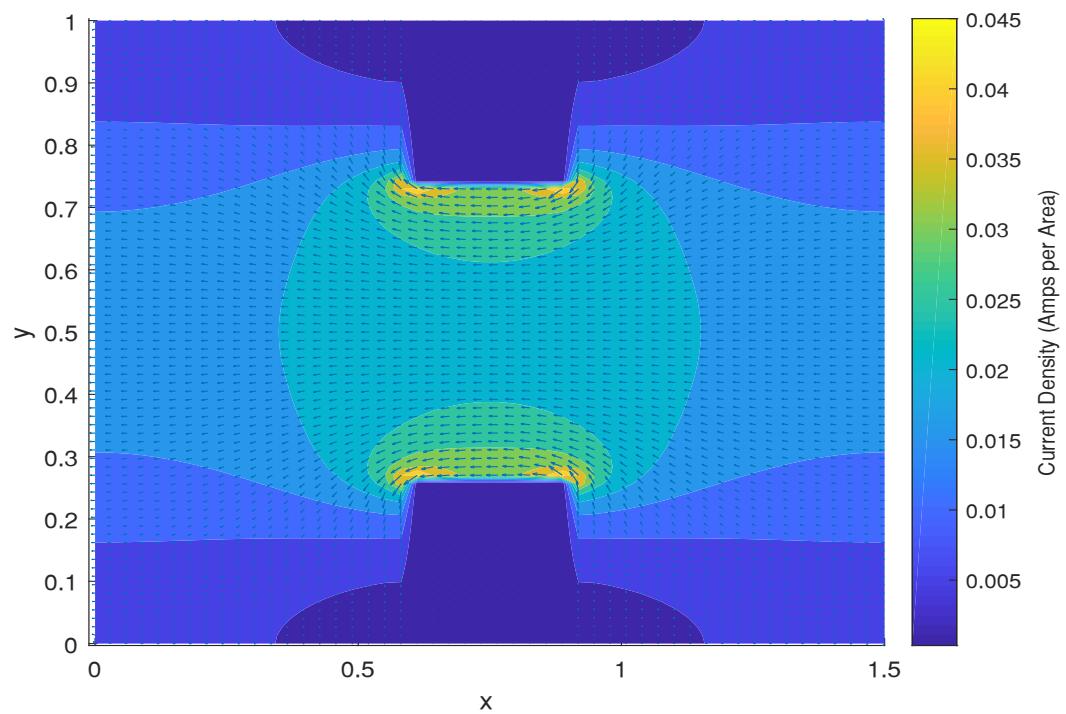


Figure 2.4. Current Density and Direction Plot

b)

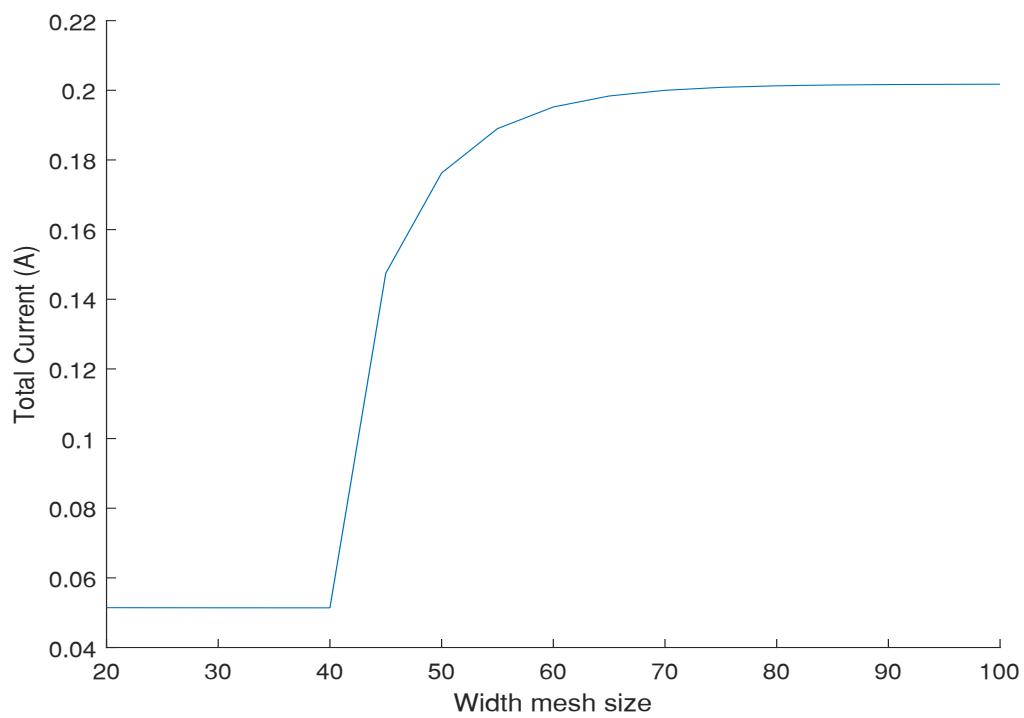


Figure 2.5. Mesh Width vs Total Current

c)

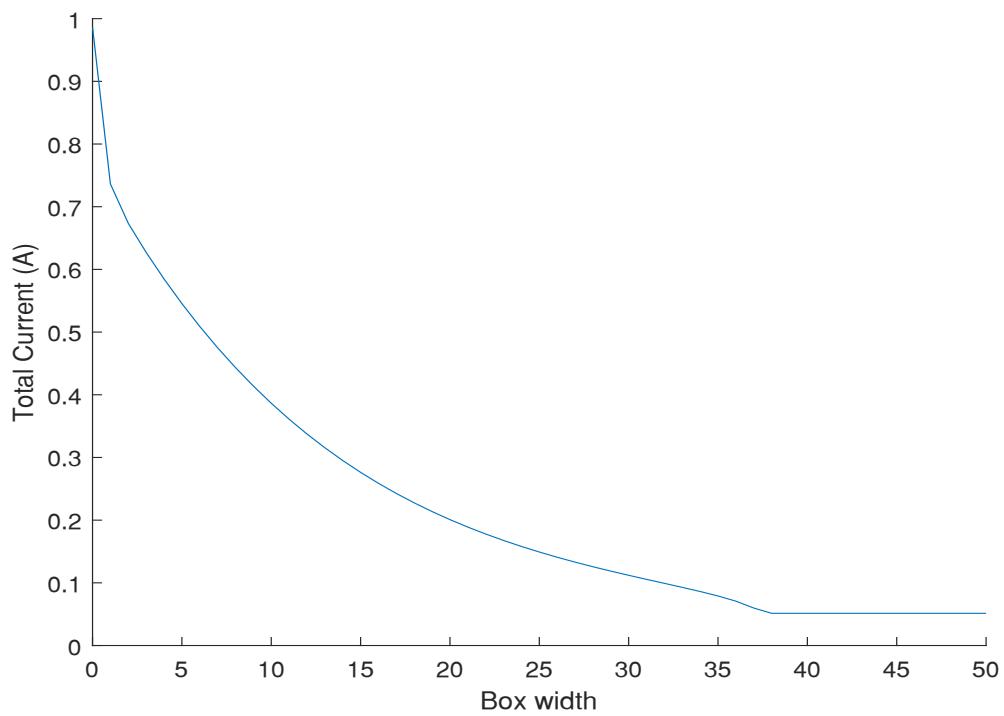


Figure 2.6. Bottle Neck Width vs Total Current

d)

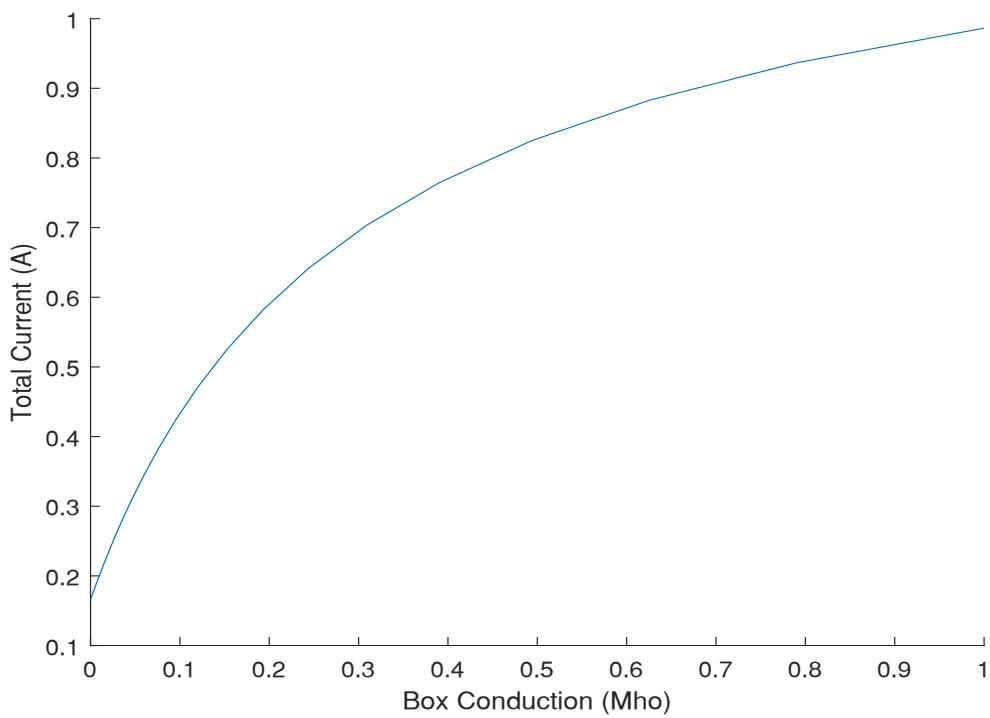


Figure 2.7. Bottle Neck Resistance vs Total Current