

# ECE329 Project #1 Report

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## 1 Problem 1

### 1.1

The plot is shown as ??.

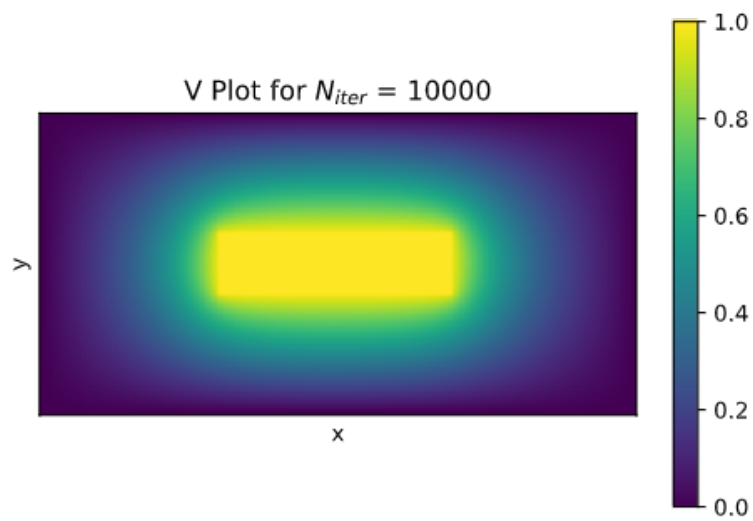


Figure 1:  $V$  over  $xy$  plane

### 1.2

The plot is shown as ??.

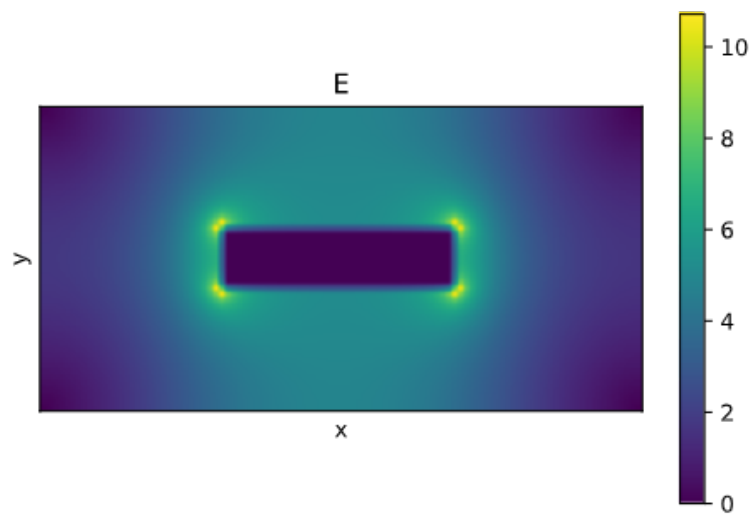


Figure 2:  $E$  over  $xy$  plane

According to the code:

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```

1 maxE = np.max(E)
2 maxi, maxj = np.where(abs(E - maxE) <= 0.1)
3 maxx = maxj * delta_x
4 maxy = Y_max - maxi * delta_y
5 max_xy = np.append(maxx, maxy).reshape(2, -1).T
6 print("Points where E is at its maxima:")
7 print(max_xy)

```

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and its output:

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```

1 maxE = np.max(E)...
2 Points where E is at its maxima:
3 [[0.3 0.31]
4  [0.69 0.31]
5  [0.29 0.3 ]
6  [0.7 0.3 ]
7  [0.29 0.2 ]
8  [0.7 0.2 ]
9  [0.3 0.19]
10 [0.69 0.19]]

```

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We can find that the maxima of E field are focused on four corners of the rectangle.

### 1.3

The plot is shown as ??.

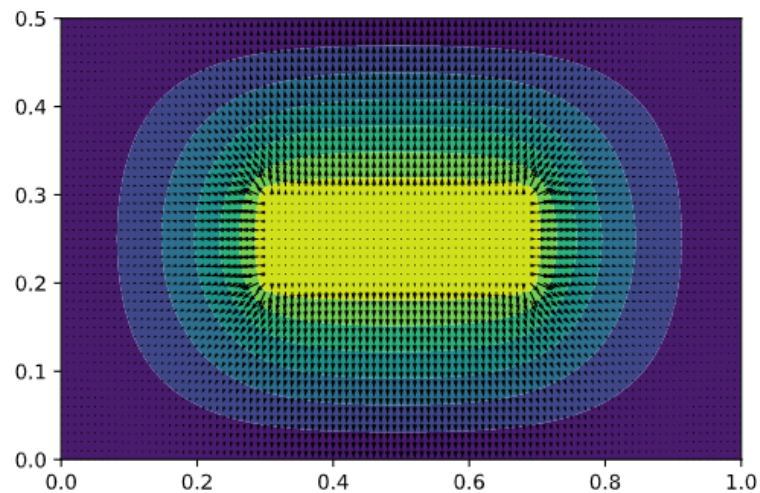


Figure 3: Contour of V and Vector Field of E

The contour lines and the vectors in the vector field are perpendicular with each other.

### 1.4

The plot of relative error of V is shown as ??. The error is in log-scale.

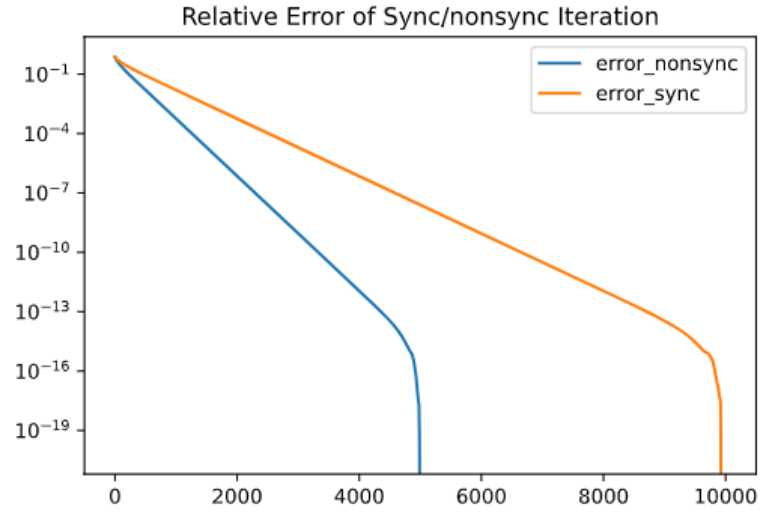


Figure 4: Relative Error of  $V$  of Sync/nonsync Iterations

## 2 Problem 2

The plot is shown as ??.

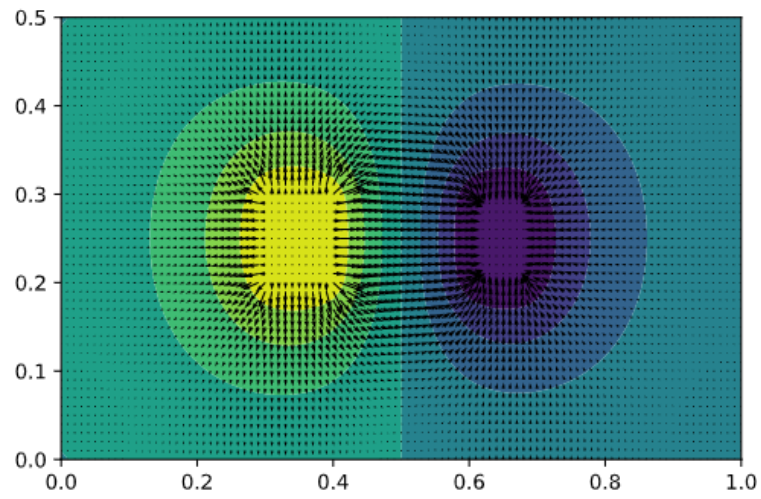


Figure 5: Contour of  $V$  and Vector Field of  $E$  for Problem 2