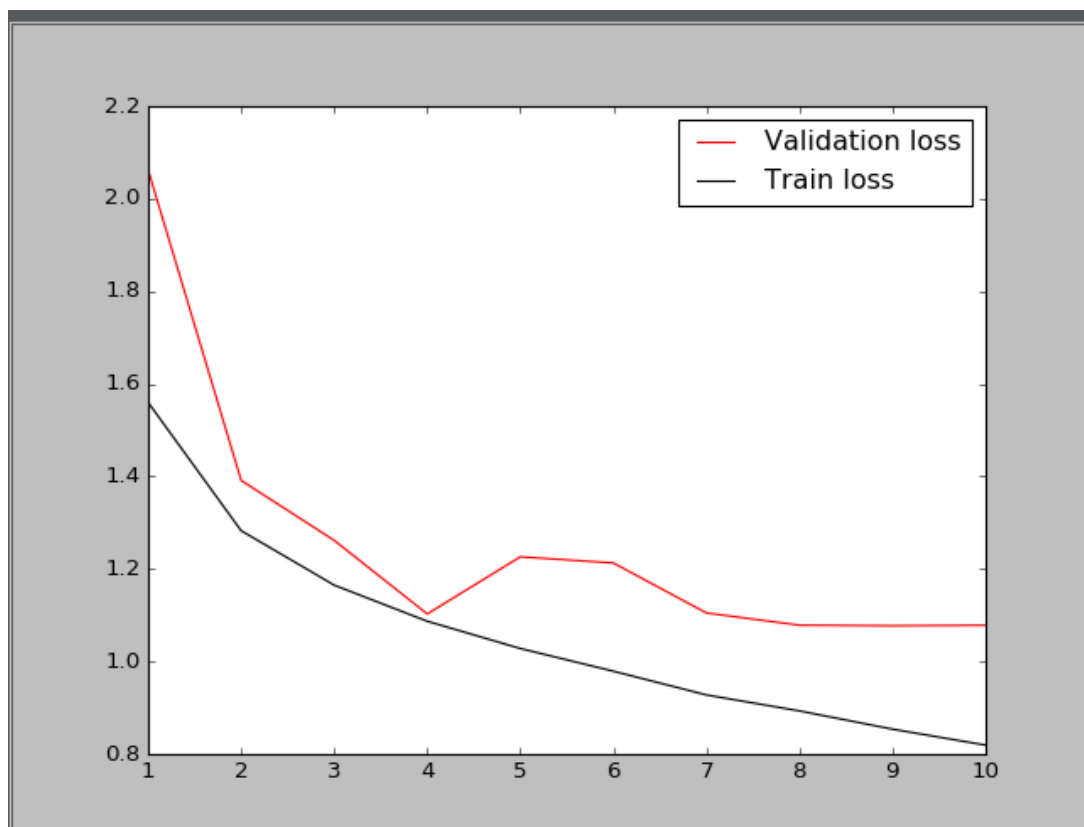


תרגיל 5

המודל הראשון:

BATCH\_SIZE = 40  
LEARN\_RATE = 0.065  
EPOCHS = 10

a.



b.

Train epoch number: 1, Average loss: 1.5598, Accuracy: 17396/40000(43%)

Validation epoch number :1 Average loss: 2.0621, Accuracy: 3540/10000(35%)

Train epoch number: 2, Average loss: 1.2825, Accuracy: 21608/40000(54%)

Validation epoch number :2 Average loss: 1.3912, Accuracy: 5148/10000(51%)

Train epoch number: 3, Average loss: 1.1649, Accuracy: 23477/40000(59%)

Validation epoch number :3 Average loss: 1.2616, Accuracy: 5525/10000(55%)

Train epoch number: 4, Average loss: 1.0869, Accuracy: 24560/40000(61%)

Validation epoch number :4 Average loss: 1.1027, Accuracy: 6159/10000(62%)

Train epoch number: 5, Average loss: 1.0280, Accuracy: 25430/40000(64%)

Validation epoch number :5 Average loss: 1.2261, Accuracy: 5785/10000(58%)

Train epoch number: 6, Average loss: 0.9790, Accuracy: 26172/40000(65%)

Validation epoch number :6 Average loss: 1.2129, Accuracy: 5850/10000(58%)

Train epoch number: 7, Average loss: 0.9277, Accuracy: 26736/40000(67%)

Validation epoch number :7 Average loss: 1.1048, Accuracy: 6220/10000(62%)

Train epoch number: 8, Average loss: 0.8931, Accuracy: 27387/40000(68%)

Validation epoch number :8 Average loss: 1.0783, Accuracy: 6389/10000(64%)

Train epoch number: 9, Average loss: 0.8537, Accuracy: 27987/40000(70%)

Validation epoch number :9 Average loss: 1.0772, Accuracy: 6366/10000(64%)

Train epoch number: 10, Average loss: 0.8192, Accuracy: 28362/40000(71%)

Validation epoch number :10 Average loss: 1.0782, Accuracy: 6305/10000(63%)

c. Test Average loss: 1.0801, Accuracy: 6364/10000(64%)

d.

```
[[737 47 24 27 32 13 9 19 55 37]
 [20 855 5 18 5 6 8 7 20 56]
 [81 34 418 80 118 117 45 87 8 12]
 [26 28 44 404 81 263 41 70 14 29]
 [27 17 39 56 619 54 37 125 15 11]
 [17 12 28 138 58 616 11 102 8 10]
 [10 29 37 99 63 67 642 27 8 18]
 [11 11 16 36 61 87 7 744 4 23]
 [90 72 8 17 12 9 4 10 745 33]
 [45 231 7 32 10 17 5 29 40 584]]
```

## המודל השני:

- a. לא צורף גרף כי בוצע אפוק אחד בלבד
- b. Train epoch number: 1, Average loss: 0.8461, Accuracy: 28537/40000 (71%)  
Validation epoch number :1 Average loss: 0.6463, Accuracy: 7770/10000 (78%)
- c. Test Average loss: 0.6467, Accuracy: 7744/10000 (77%)
- d.

```
[[715 14 73 37 12 0 1 13 106 29]
 [ 9 880 10 16 0 1 2 5 22 55]
 [ 20 0 797 85 44 9 27 10 7 1]
 [ 8 2 46 808 32 52 22 12 15 3]
 [ 7 3 100 70 720 10 22 50 12 6]
 [ 0 3 45 251 31 625 10 34 1 0]
 [ 2 5 101 134 45 8 691 4 7 3]
 [ 7 1 49 69 64 20 1 770 6 13]
 [ 30 36 21 20 6 3 1 1 868 14]
 [ 19 57 5 17 1 1 2 3 25 870]]
```