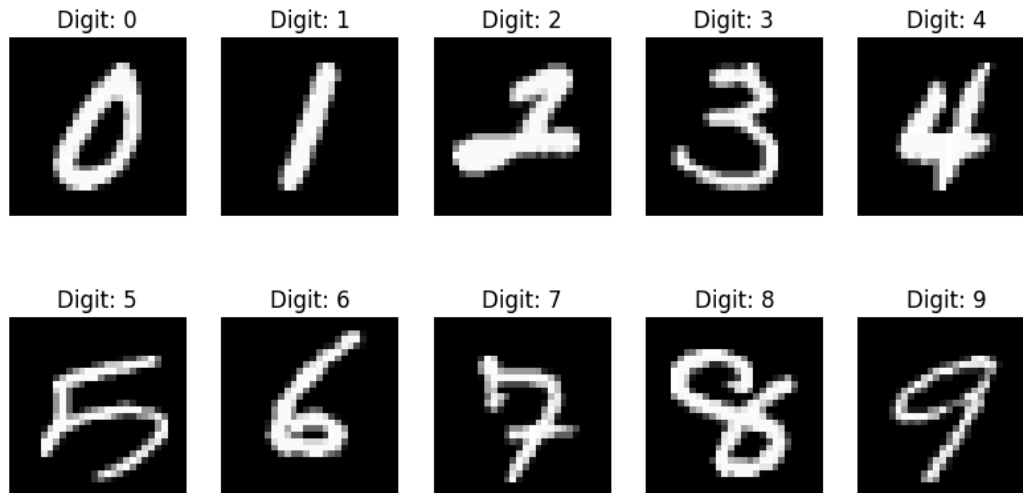


Neural Networks - Homework4

1.a)OUTPUT



1.c)

```
d = 10: MSE = 0.07656294109759007, Mistakes = 38587
d = 50: MSE = 0.05335488004760626, Mistakes = 15594
d = 100: MSE = 0.04640982361643528, Mistakes = 12430
d = 200: MSE = 0.04225353635374769, Mistakes = 11000
d = 500: MSE = 0.039377841635735815, Mistakes = 10397
```

If we were to randomly guess a digit from 0 to 9 for each image in the dataset, the probability of guessing correctly is $1/10$, while the probability of being wrong is $9/10$.

Given the dataset's 70,000 images, we can estimate the expected number of mistakes from random guessing as follows:

$$\text{Expected Mistakes} = 9/10 * 70,000 = 63,000$$

Comparing the number of mistakes in the table to the expected number of mistakes, we can see that the model is performing significantly better than random guessing. For example, when $d=10$, the model makes 38587 mistakes, which is much lower than the expected number of mistakes.

Based on the table, it appears that a good choice for d is around 200-500. At these values, the model achieves a relatively low MSE and a relatively low number of mistakes.

1.d)

