Assignment 7 – Report

In my neural network I got a mean squared error of approximately 0.0365 for the training set, and 0.0378 for the test set using the trained model. As expected, it is more accurate on the training set, likely due to overfitting.

Hyperparameters:
- Learning rate = 0.007
- Number of iterations = 250
- Weights initialized using random numbers from a standard normal distribution with seed 0 in NumPy's random numbers generator for reproducible results.

I experimented with different combinations of learning rates and the number of iterations to get the best result. Capped at 250 iterations due to growing loss after this mark. Larger learning rates cause my model to diverge due to overflow in the exponential function.

I could better my results by for instance:
- Implementing batches
- Using other activation functions than sigmoid (and linear)
- Using biases
- Regularization
- Clipping gradients in backpropagation

```
Iteration 0, loss: 18.645301255671484
Iteration 10, loss: 480.3545894134351
Iteration 20, loss: 216.52479346135846
Iteration 30, loss: 93.08769241227023
Iteration 40, loss: 41.65817923415395
Iteration 50, loss: 20.29314017584168
Iteration 60, loss: 11.419673940987114
Iteration 70, loss: 7.733557899040477
Iteration 80, loss: 6.201947404322724
Iteration 90, loss: 5.565403871635483
Iteration 100, loss: 5.300796180687945
Iteration 110, loss: 5.19078063744935
Iteration 120, loss: 5.145036922621026
Iteration 130, loss: 5.12602187646277
Iteration 140, loss: 5.118125927848249
Iteration 150, loss: 5.11485713384268
Iteration 160, loss: 5.11351470405662
Iteration 170, loss: 5.112974685514861
Iteration 180, loss: 5.112769176743546
Iteration 190, loss: 5.112703320673014
Iteration 200, loss: 5.112695939621517
Iteration 210, loss: 5.112713202827036
Iteration 220, loss: 5.112741006991229
Iteration 230, loss: 5.1127734717623845
Iteration 240, loss: 5.112808145780099
Iteration 250, loss: 5.112844008198646
Mean squared error on training set: 0.0365
Mean squared error on test set: 0.0378
```