1. How do neural networks differ from logistic regression?

It really varies on the level of complexity the problem requires.  In theory, logistic regression is a more simple classification algorithm.  In essence we are comparing Vector Calculus to Linear Algebra.  Sure, Vector Calculus is simple enough that can be done in paper but Linear Algebra can get more complex due to the x numbers of dimension in the problem.  Neural Networks are adaptive for real world complex classification and approximation.  Whereas Logistic Regression is more of a simpler, but still very reliable resource.

<https://jamesmccaffrey.wordpress.com/2018/07/07/why-a-neural-network-is-always-better-than-logistic-regression/>

<https://www.sciencedirect.com/science/article/pii/S1532046403000340>

<https://sebastianraschka.com/faq/docs/logisticregr-neuralnet.html>

2. If we have three classes of outputs in the final layer of a neural network, how many weight vectors do we need to train in the final layer?

Weight is the parameter within a neural network that transforms input data within the network's hidden layers.  Given that we have three classes as the final layer than we must have had three weight vectors.

https://deepai.org/machine-learning-glossary-and-terms/weight-artificial-neural-network

3. Say that our input to an activation is -3. Show the output for the sigmoid, hyperbolic tangent, ReLU, and softplus activation functions.

A screenshot of a cell phone

Description automatically generated

4. What is the difference in the output layer between a neural network used for classification, and one used for regression?

Well in a classification model we are predicting the probability a piece of data falls within the classification.  Whereas for a regression method, there are activation inputs that can then be used to provide the actual piece of data tha falls within that model.

5. Describe why we need to use regularization in neural networks.

Regularization is used in neural networks in order to make sure the model does not over/under-fit.