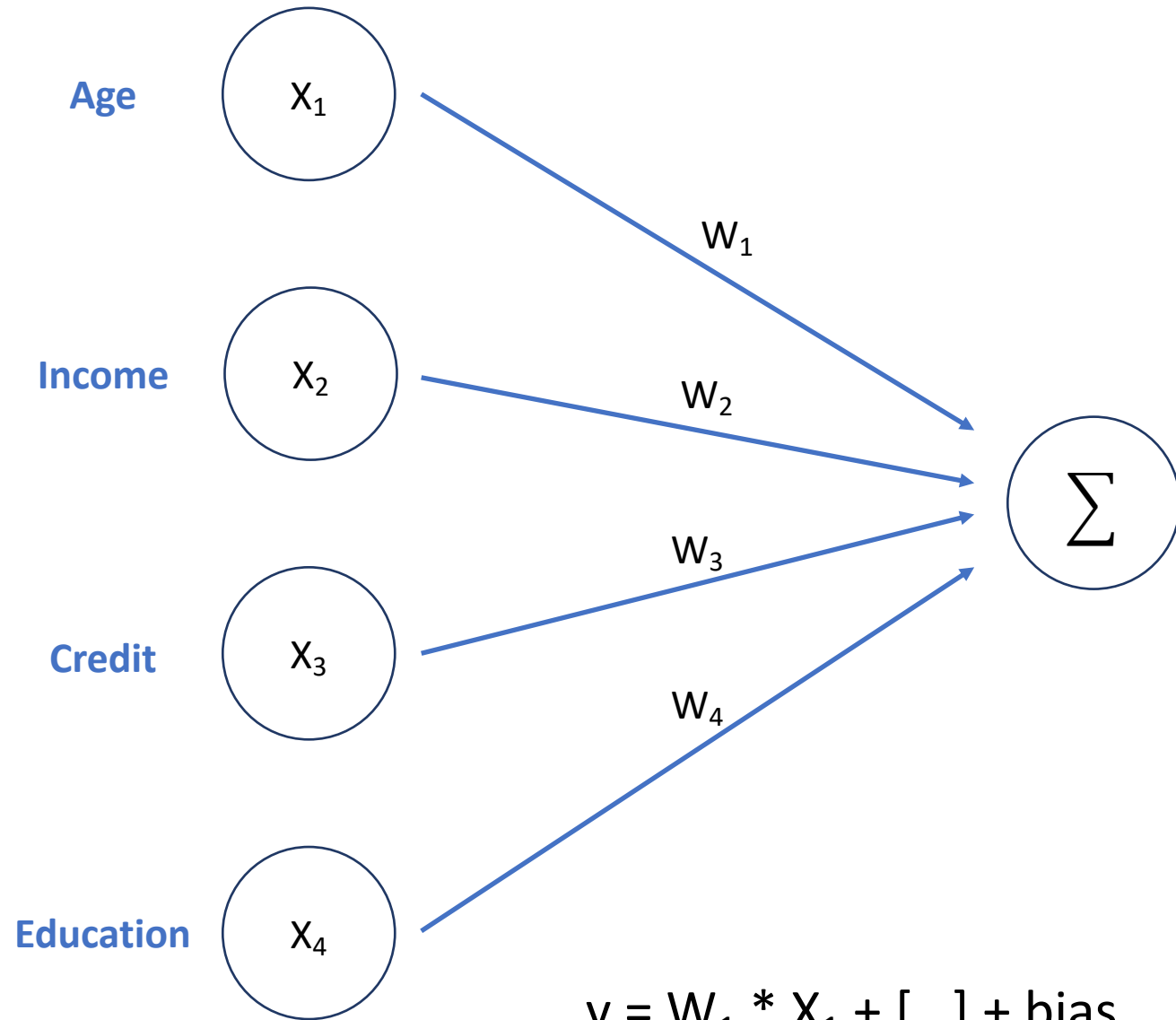


Activation Function

- Activation functions are used to get the output of node.
- Activation functions map the values between 0 to 1 or -1 to 1 etc, depending on the function.



$$(PAC, SHO, PAS, DRI, DEF, PHY) * \begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \\ w_5 \\ w_6 \end{bmatrix} = (w_1 * PAC + w_2 * SHO + w_3 * PAS + w_4 * DRI + w_5 * DEF + w_6 * PHY)$$

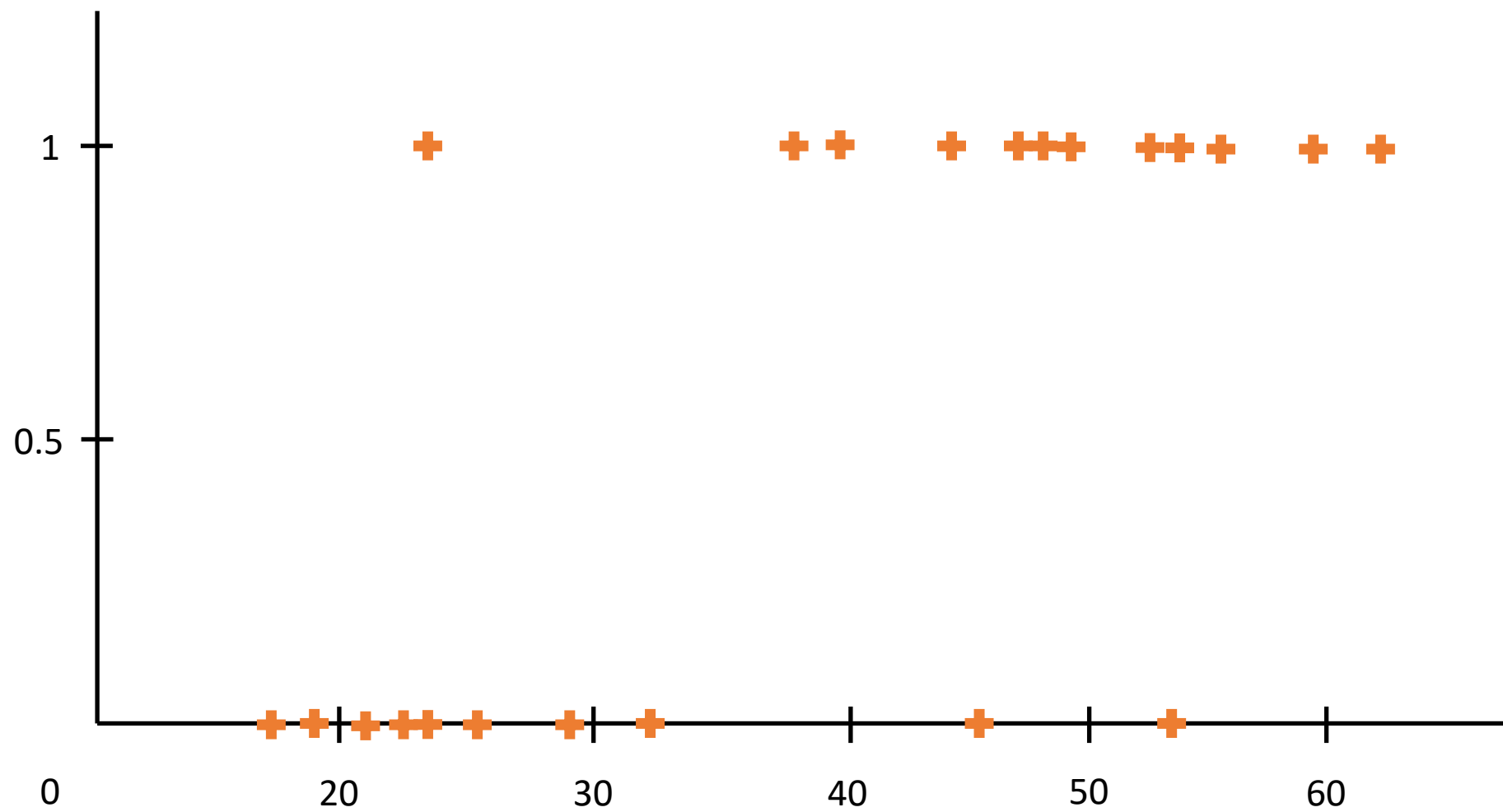


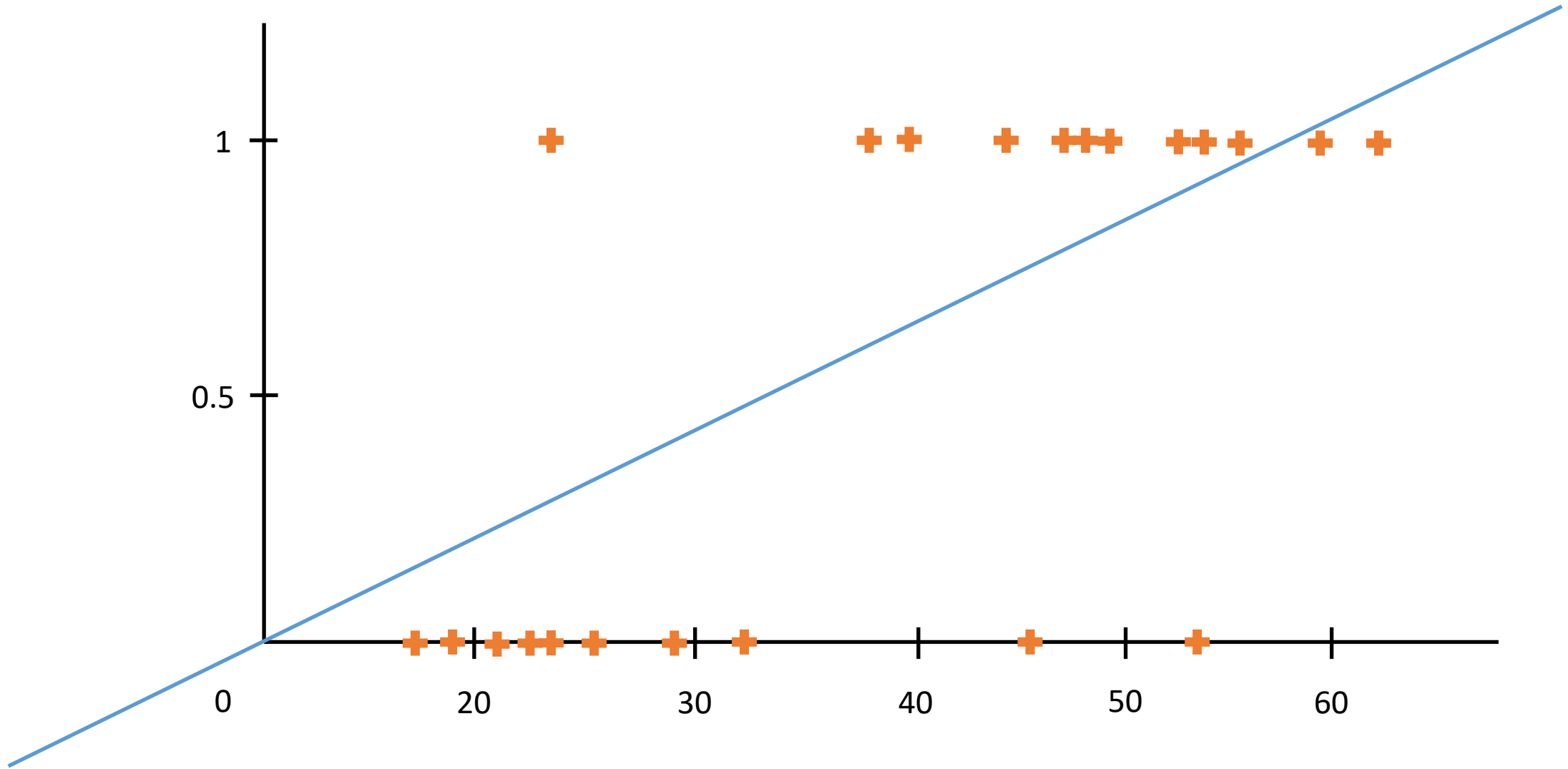
$$y = W_1 * X_1 + [...] + \text{bias}$$

$$y = 0.05 * X_1 + 0.25 * X_2 + 0.15 * X_3 + 0.012 * X_4 - 1.22$$

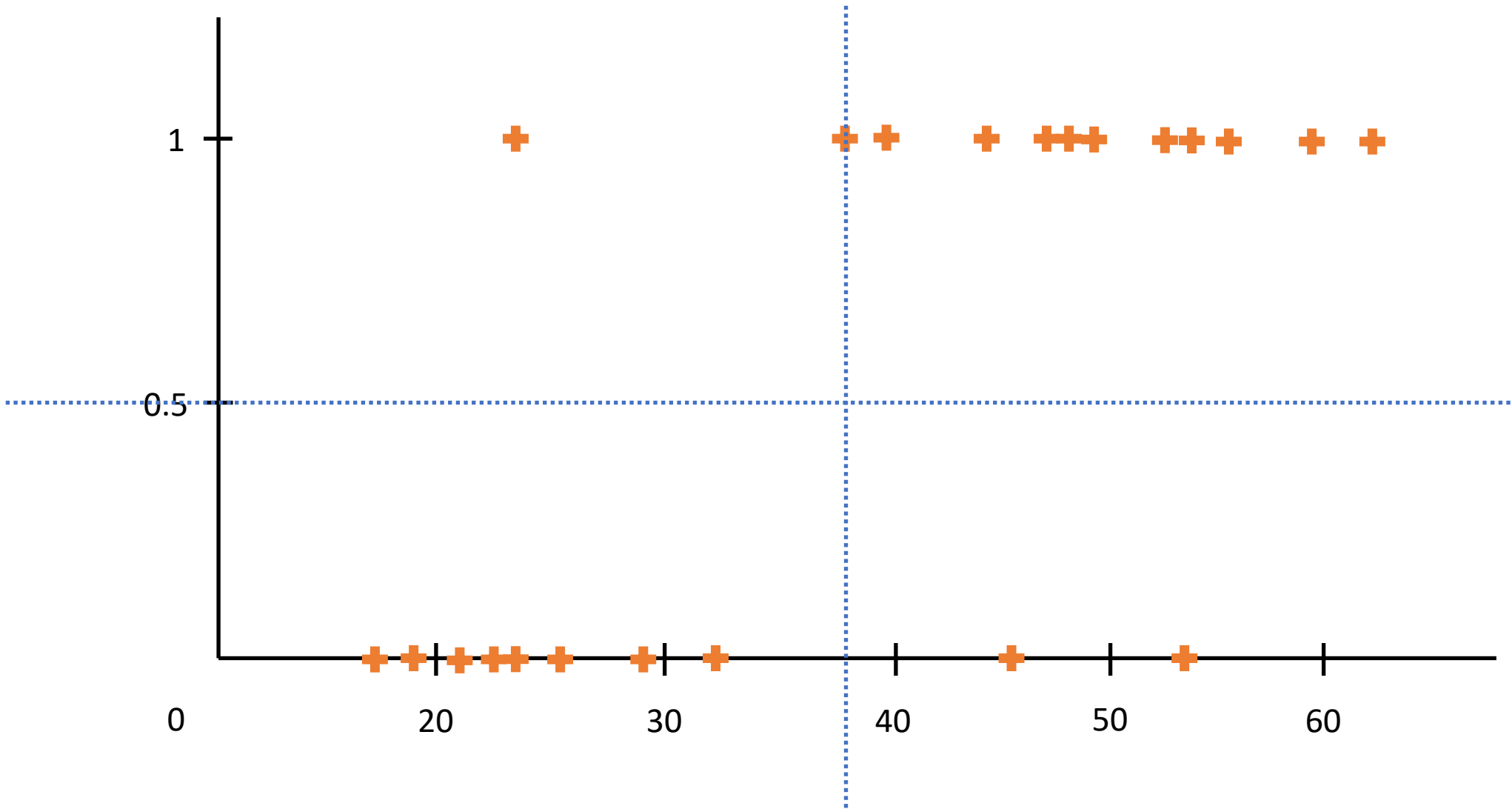
Binary Classification

Age	Buy_Car
21	0
48	1
28	0
19	0
56	1
65	1
32	1
24	0
43	1
22	0
53	1

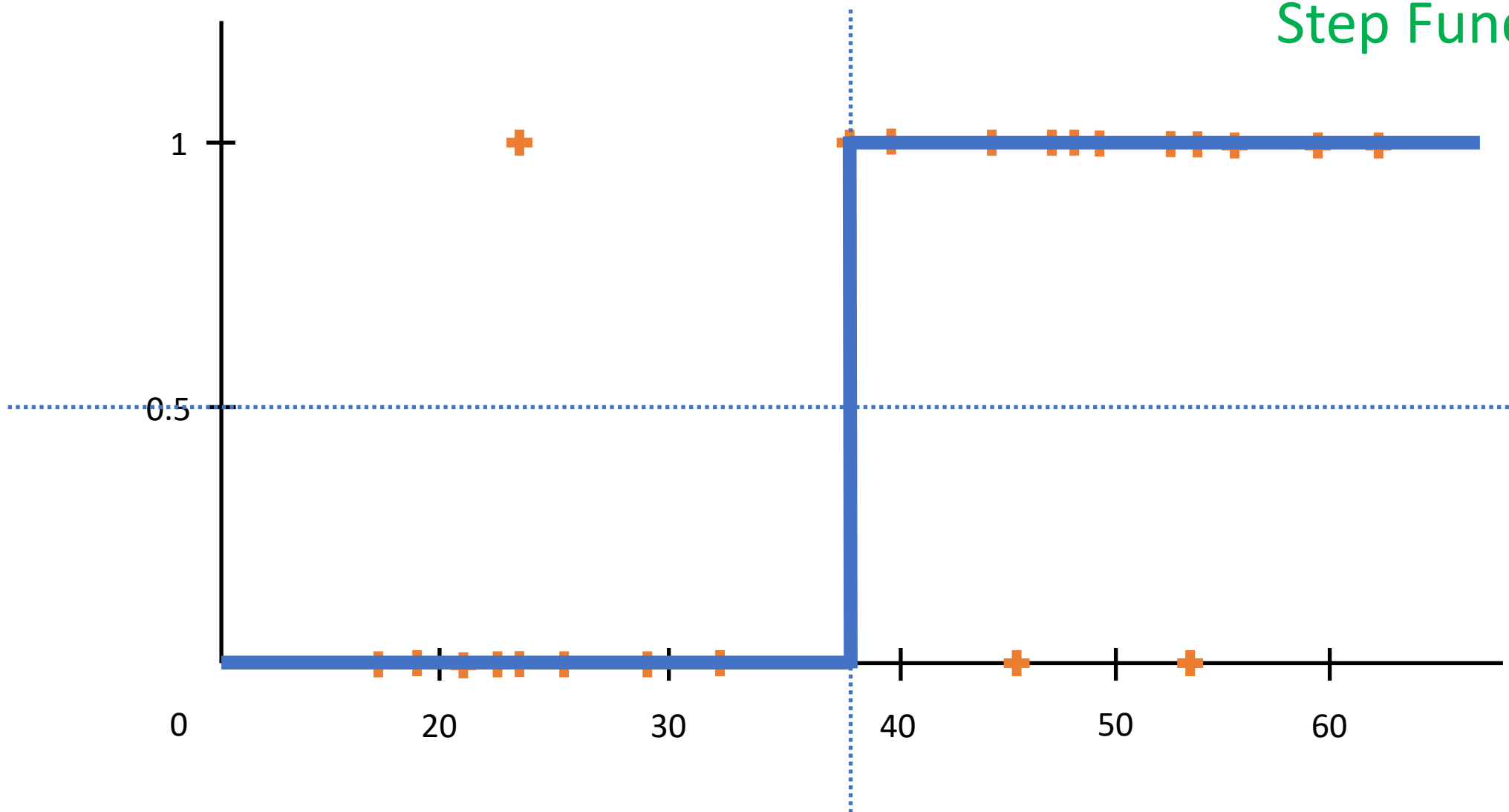


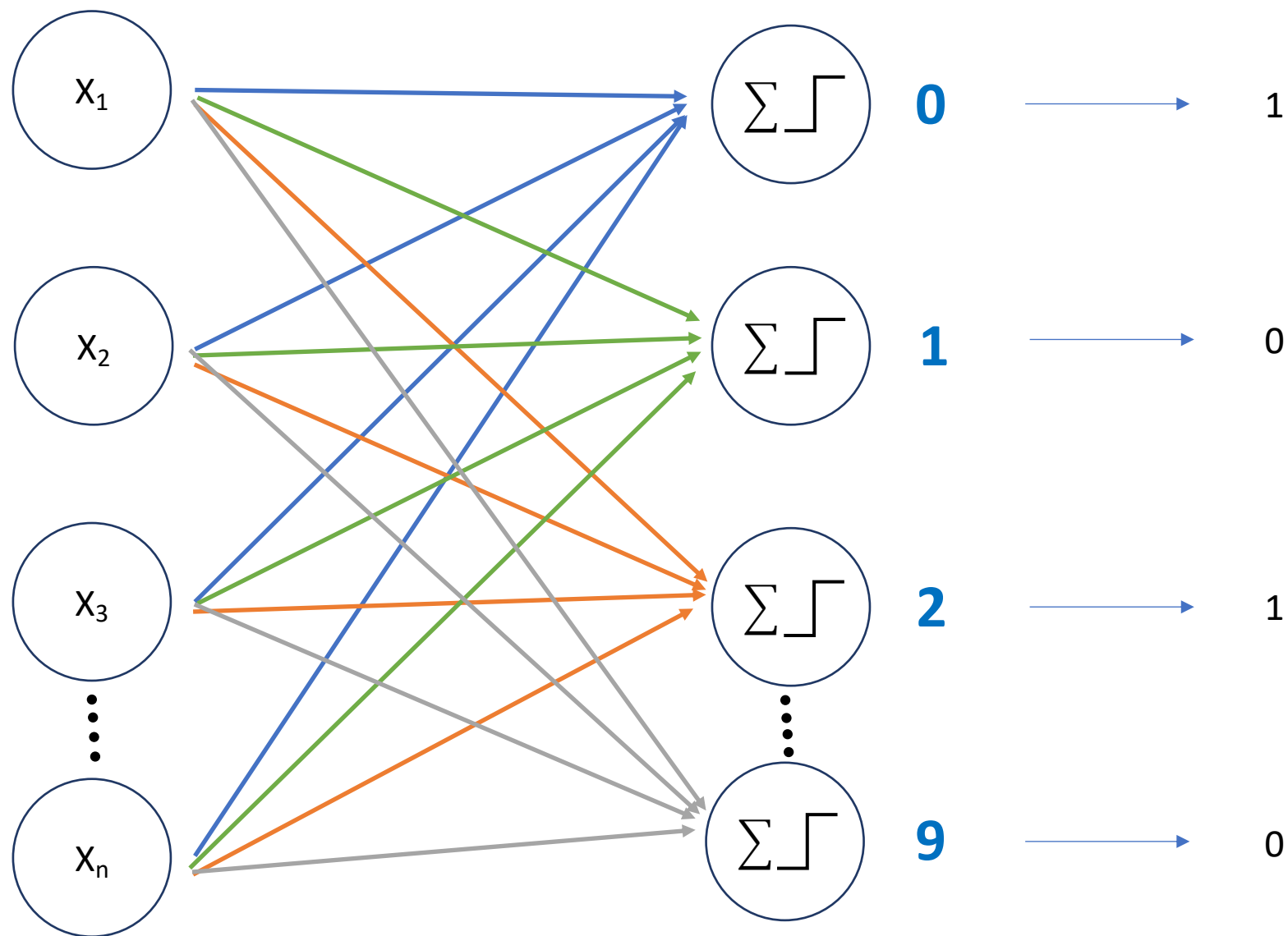


Buy a car?



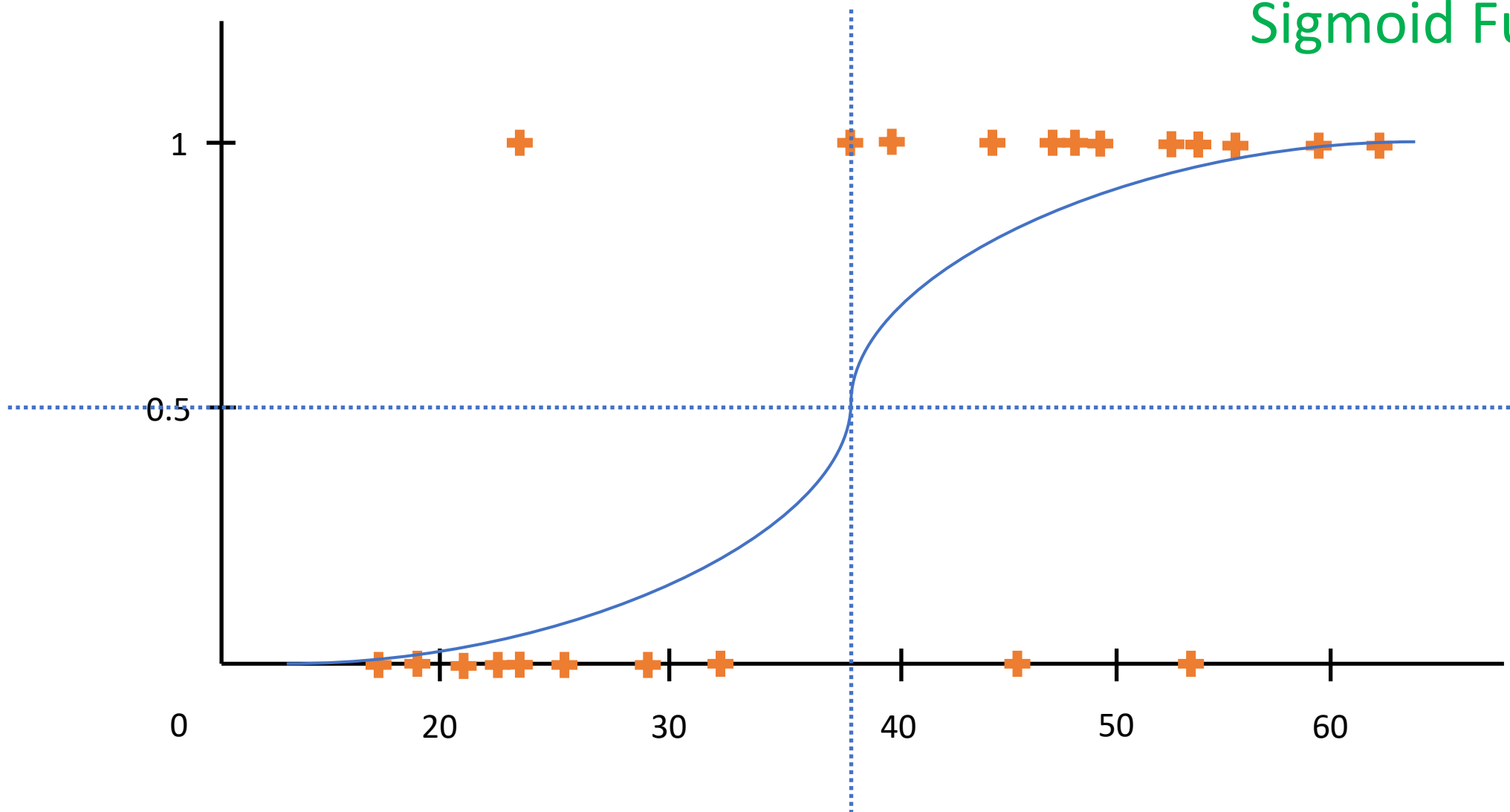
Step Function

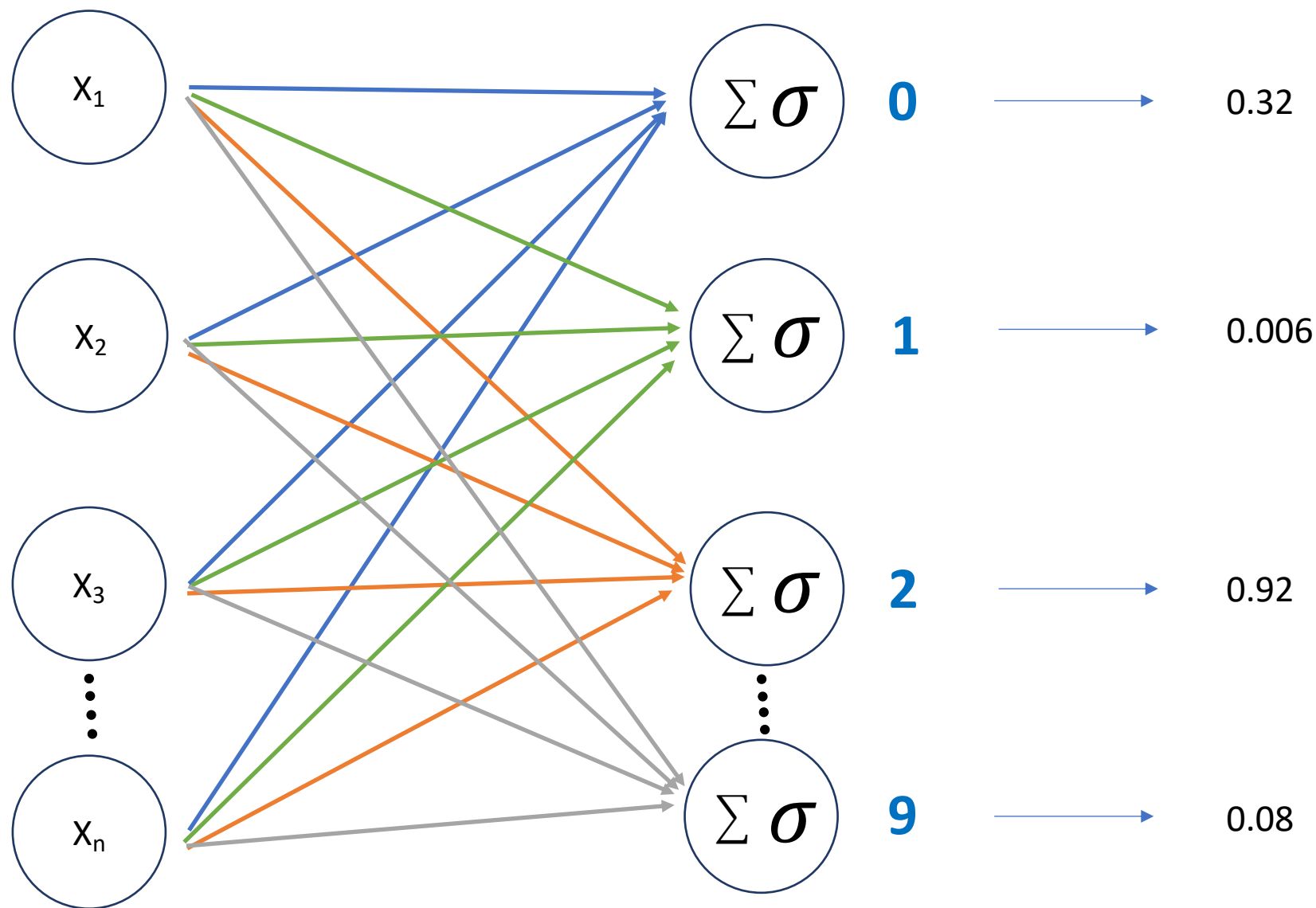




$$y = 0.05 * x_1 + 0.25 * x_2 + 0.15 * x_3 + 0.012 * x_4 - 1.22$$

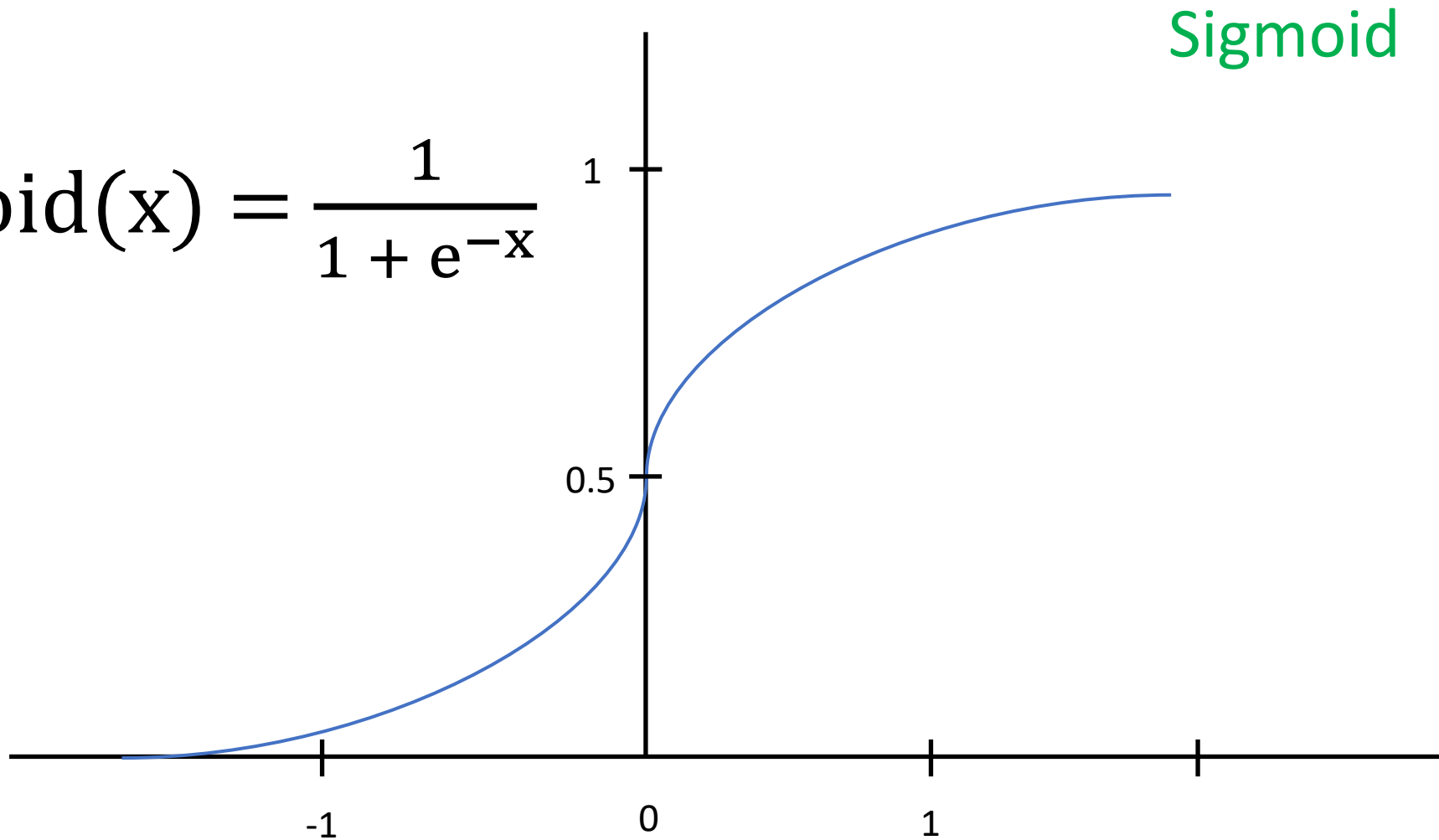
Sigmoid Function



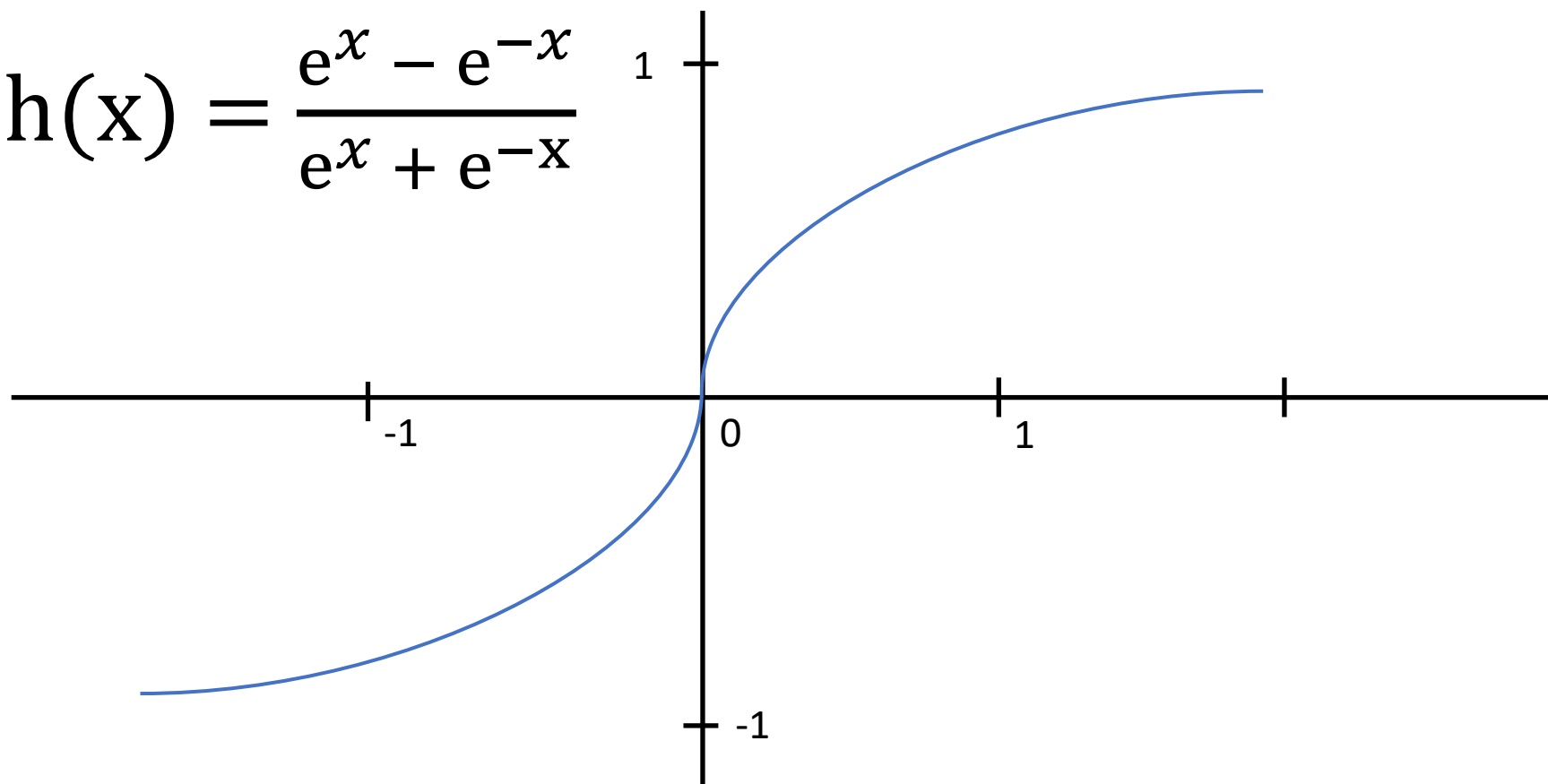


$$y = 0.05 * x_1 + 0.25 * x_2 + 0.15 * x_3 + 0.012 * x_4 - 1.22$$

$$\text{sigmoid}(x) = \frac{1}{1 + e^{-x}}$$



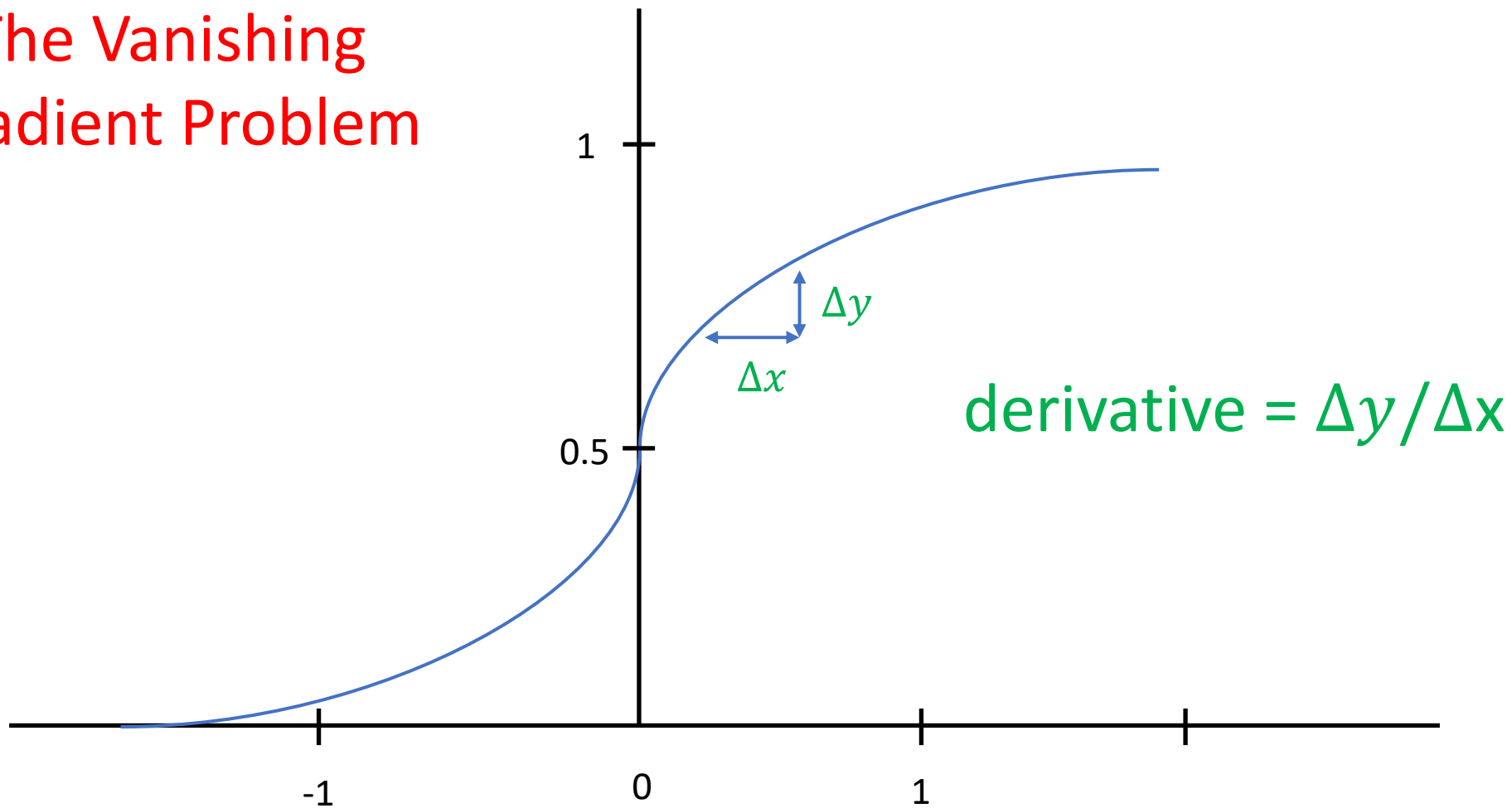
$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$



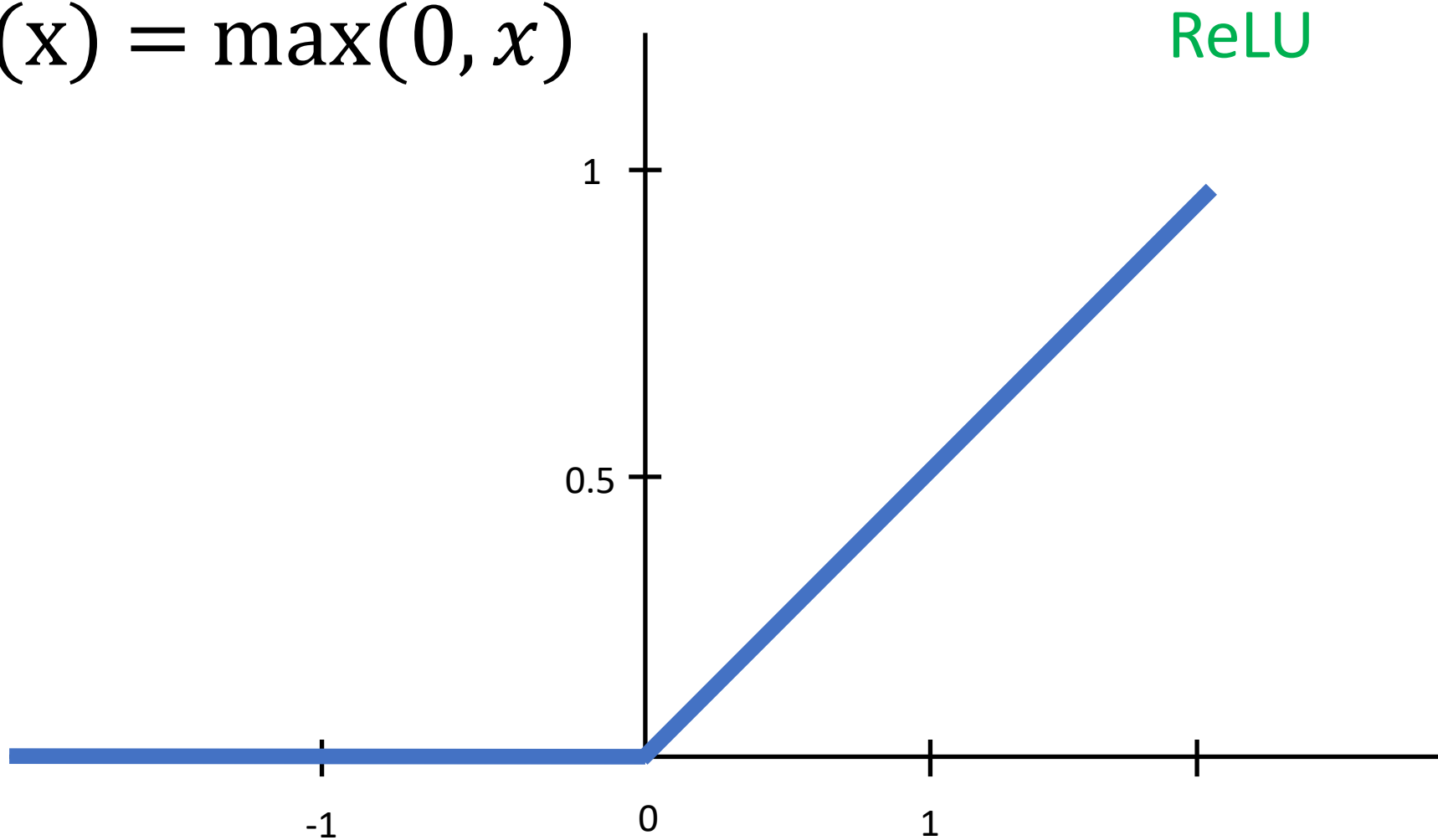
tanh

Issues with sigmoid and tanh

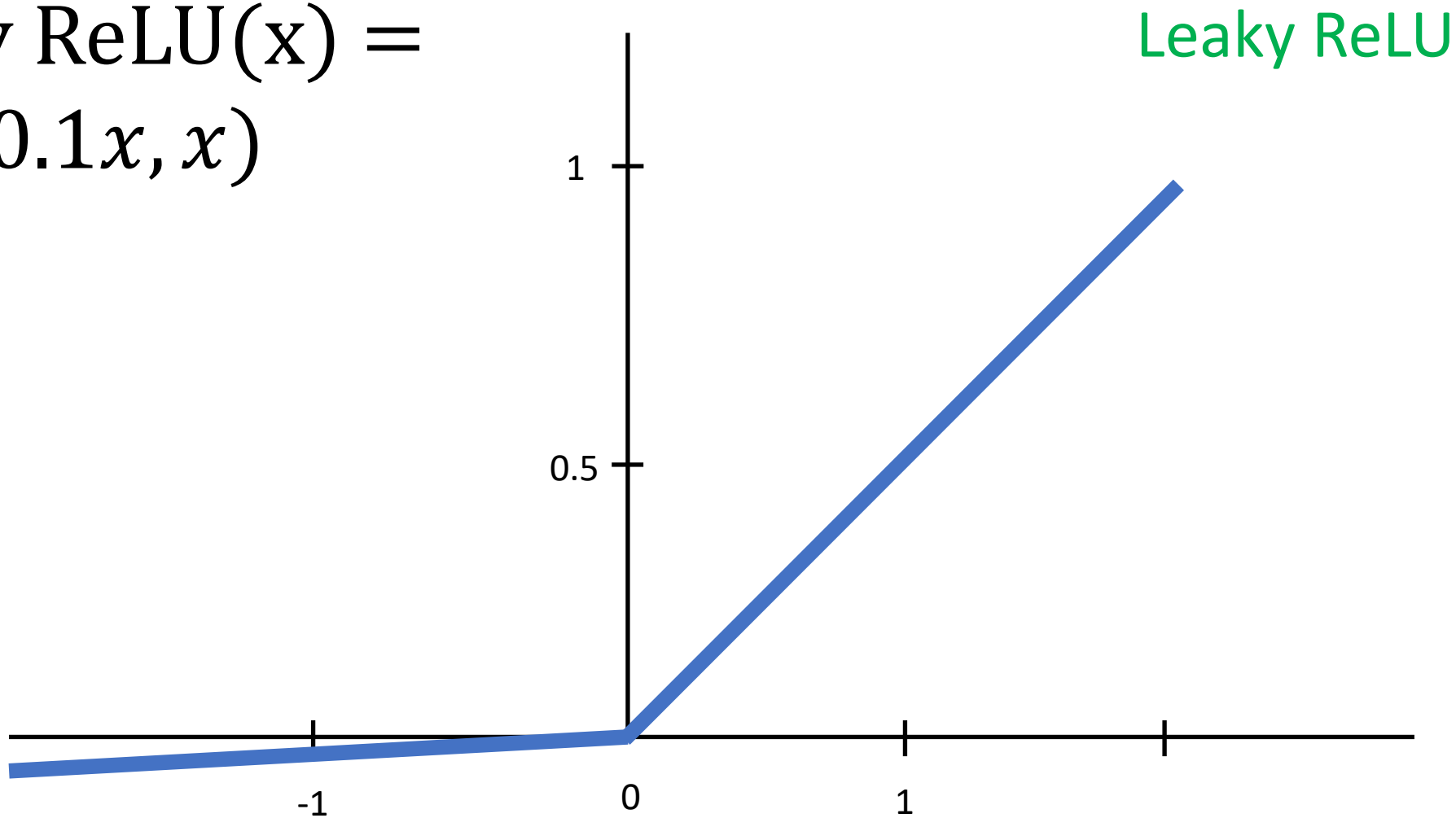
The Vanishing Gradient Problem



$$\text{ReLU}(x) = \max(0, x)$$



$$\text{Leaky ReLU}(x) = \max(0.1x, x)$$



Activation Function

- PyTorch: `torch.nn.ReLU()` / `torch.nn.LeakyReLU()` ...

(<https://pytorch.org/docs/stable/nn.html>)

- TensorFlow-Keras: `tf.keras.activations.relu()`

(https://www.tensorflow.org/api_docs/python/tf/keras/activations)