NOTE: To verify the codes please run them using python3.

Answer to Q1

Output File Dir: 1/outputs/ --- contains **ipynb** exported pdf file displaying trial for 5 different binary function.
Code: Run either **1/BooleanFunction.py** or **1/BooleanFunction.ipynb** to run a trial with any binary function.

Answer to Q2

Output File Dir: 2/outputs/ --- contains plots for reward vs episode for different alpha and lambda. And also for N and M.
Code: Run either **2/FrozenLake.py** or **2/FrozenLake.ipynb** to run a trial with any binary function.

Observations:

- Performance increases on increasing alpha, a slight decrease in performances when alpha gets close to 1.
- For lambda = (0, 1) for both, there is almost no learning. Performance is good at some intermediate value.
- Performance increases on increasing **N**
- Performance decreases with the decrease in **M**

Answer to Q3

Output File Dir: 3/outputs/ --- contains plots of x vs n for different alpha and sigma.
Code: Run either **3/neuron-model.py** or **3/neuron-model.ipynb** to generate the results in the output folder.

Observations:
Observation was made by varying alpha from 2 to 8. And sigma from -1 to 1.

- For sigma equals -1 and -0.89 all models were of silence type.
- By increasing sigma to -0.79 at alpha = 8 the model was of burst type, while for others silence type.
- By further increase in sigma, the model becomes burst type for upper alpha and silence type for lower values of alpha.
- For all the negative sigmas only burst and silence model were found. At sigma = -0.05, for alpha = (5, 6.5, 8) It was of burst type while for alpha = (3.5, 2) It was of silence type.
- At sigma = 0.26, I found all the three models for different alphas i.e.
    - For alpha = 2: silence type
    - For alpha = 3.5: tonic type

    - For alpha > 3.5: burst type
- On further increase of sigma, silence type got vanished after sigma > 0.58. And there was an increase in the number of tonic type on an increase in the value of alpha.
- At sigma = 1: for all alpha from 2 to 8 only tonic type was found.

Conclusions:

- **Silent** type is generally in the region of negative sigma for lesser values of alpha.
- **Tonic** type is found around positive sigma with alpha centring around in between of (3.5/2 + 5/2 = 4.25). The range around 4.25 increases on increasing sigma.
- **Burst** type is found around sigma centred around 0 with alpha > 4.25, the range for sigma around 0 increases with increase alpha.