Mathematical Foundations of Neuroscience - Sample Questions - Lecture 2 - Electrophysiology of neurons

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Questions marked with * are not obligatory.

1. Define the total derivative of a multidimensional mapping.

2. What is the difference between PDE and ODE?

3. Explain (possibly using the hydraulic analogy) functions of simple electric elements: resistor, capacitor, source of voltage. Can you think of other electric elements (inductor, transistor?) and find their hydraulic analog?

4. Briefly describe the morphology of a typical neuron.

5. Describe the membrane potential. What ionic species can be found on the inside and on the outside? Roughly estimate the concentrations (or their ratios)?

6. What is the Nerst potential?

7. Derive the equation for the current across the membrane. *