Computation in biological systems: biological and computational vision
Exercise 2

1) No photoreceptors are located in the retinas’ optic disks. Why aren’t we blind in the part of the visual field that falls on the optic disk?

2) True or False: the right hemisphere treats visual information from the left eye and vice-versa.

3) Describe the basic structure of the eye, from the cornea to the optic nerve.

4) Moonlight is good for romance. But can one read a newspaper? Can one see colors? Explain why or why not.

5) A novel kind of plastic reflects light only (and equally) at wavelengths of 450, 500 and 600 nm (and not at all elsewhere). You illuminate it with a special techno dance club light, that emits a flat spectrum between 400 and 550 nm (and zero elsewhere). What are the approximate relative L, M and S cone responses to this stimulus?

6) You look at your best friend. He is pretty square (top). The reflectances of his mouth, nose, eyes and skin are 50%, 60%, 10% and 90%.
One of your ganglion cells is very linear. It is OFF-center, and has gain -1.0 in the center pixel and +0.1 in the 8 surrounding pixels (middle).
As you move your eye around, you place that ganglion cell in the three positions indicated here (bottom).

A) If you turn on a 100W light, what are the responses of the ganglion cell in those three positions?
B) And if you turn on 10 times more lights?
C) Why were you able to answer question 1? Did you have to rely on the cell being linear?
D) How would you tell if a cell is not linear?