Lab 1 - Linear Algebra Answers
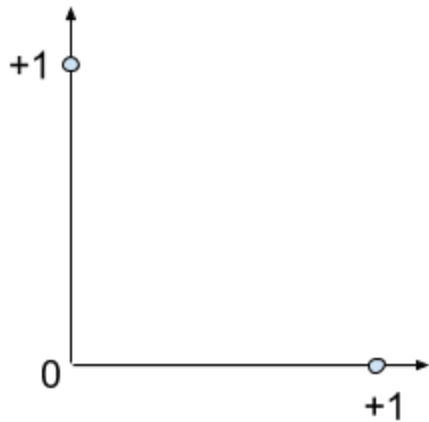
3.1.1
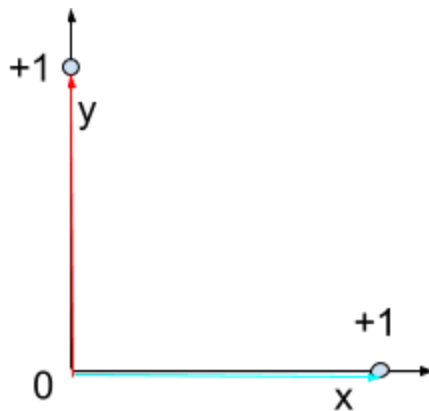

3.1.3

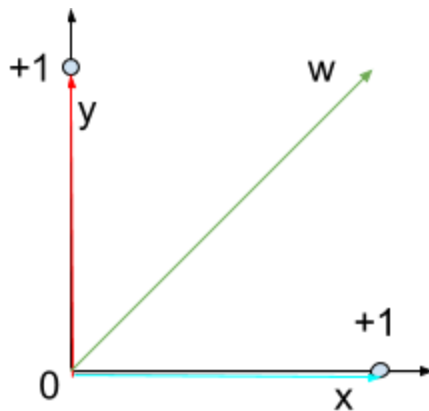$x = (1, 0) \;\text{->}\; \|x\| = \sqrt{1^2 + 0^2} = 1$

3.1.4

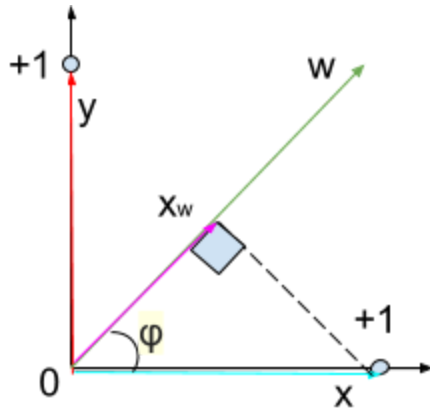$x \cdot y = 1 * 0 + 0 * 1 = 0 + 0 = 0$

3.1.5

The two vectors x and y are perpendicular and the inner product of two perpendicular vectors is zero.

3.1.6

3.1.7

3.1.8
The cosine of angle f is defined as adjacent / hypotenuse and from the figure as we can see it is pretty obvious that $\cos(f) = \dfrac{x_w}{\|x\|}$.

3.1.9
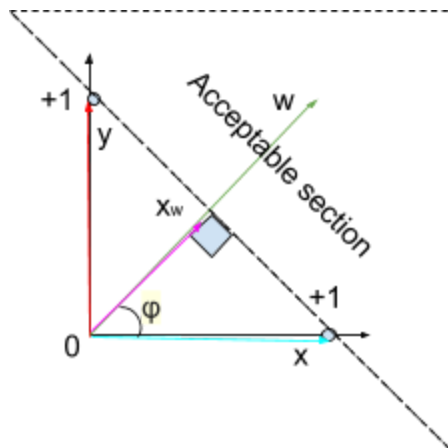$x \cdot w = \|x\| \|w\|\cos(\varphi)$ (replacing the formula from the previus subquestion) =>

$x \cdot w = \|x\| \|w\| \dfrac{x_w}{\|x\|}$ => $x \cdot w = \|w\| \, x_w$

3.1.10
(a1*1+a2*1) -0,6 >0 => a1+a2 > 0,6

3.1.11

3.2.1
Action potential is the result of EPSP's that depolarized the membrane potential sufficiently overpassing the threshold so that a new action potential can be created. When an action potential reaches the axon terminal of a synapse, neurotransmitter is realised into the synaptic cleft. It reaches postsynaptic membrane and specifically receptor sites where molecules of neurotransmitter bind and create a PSP. Then it depends on the PSP type (EPSP, IPSP) if the membrane potential will change in a way so that a new action potential can be created.

3.2.2
Hyperpolarization occurs when IPSP's are created and our membrane potential has a negative equilibrium value and as a result membrane potential gets even more negative.
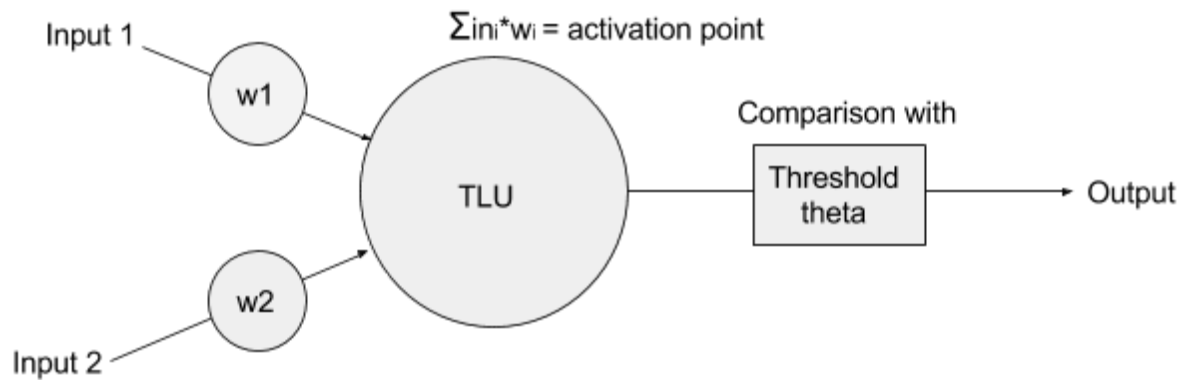
3.2.3
PSP is the change in membrane potential that occurs from activity at a synapse.

In an artificial neuron it is represented as the summation of inputs multiplied with the weight vector (we must put the equation).

3.2.4

Both step function and action potential have to overpass the given threshold in order to continue farther.

3.3.1

$$\sum i n_i * w_i = \text{activation point}$$

Input 1 — w1 → TLU → Comparison with Threshold theta → Output

w2 — Input 2

The 3 elements are :
1. the weighted vector
2. the activation point
3. the threshold

3.3.2

weighted vector = receptor sites

summation = PSP

threshold = membrane potential

3.3.3

Variables:

input

output

weight vector

activation point

threshold

Functions:

computation of activation point(input,weight vector)

compare activation point with threshold and output (activation point,threshold)