VIR 2018 **Name:** _____

Test 1

Time Limit: Teaching Assistant _____

1. Draw computational graph for the learning of the classifier $f(x, [w_0, w_1]) = w_1 x + w_0$ with the logistic loss.
   Hint: logistic loss of classifier output z for label y is $\mathcal{L}(y, z) = -\log(\sigma(yz))$.

2. Compute feed-forward pass with the following values: $w_0 = -1, w_1 = 1, x = 2, y = -1$.
   Hint: assign a variable to each edge and evaluate its value and write it directly into the computational graph. Make use of the following table:

v	-2	-1	0	1	2
$\sigma(v)$	0.12	0.27	0.5	0.73	0.88
$\log(\sigma(v))$	-0.92	-0.57	-0.3	-0.14	-0.06

   - What is the value of the logistic-loss for given inputs

     $\mathcal{L} =$

3. Compute one iteration of the backpropagation algorithm, with the learning rate $\alpha = 1$. One iteration consists of the following steps:

   (i) compute gradient wrt w_0, w_1 by the backward-pass,

   (ii) update weights w_0, w_1 in order to decrease logistic-loss,

   (iii) substitute updated weights and compute the value of the new logistic-loss (values of σ and log for the updated feedforward pass are not in the table - just approximately guess the value of the resulting logistic loss).

   Hint: $\frac{d\sigma(z)}{dz} = \sigma(z)(1 - \sigma(z))$

   - What is the gradient (expression + value) of the back-propagated logistic loss?

     $\frac{\partial \mathcal{L}}{\partial w_0} =$

     $\frac{\partial \mathcal{L}}{\partial w_1} =$

   - What are updated weights (expression + value)

     $w_0^{\text{updated}} =$

     $w_1^{\text{updated}} =$

   - What is the value of the updated logistic loss?

     $\mathcal{L}^{\text{updated}} =$