ex1 - Lior Ziv

1. show that for two sequences $\overrightarrow{t}$,$\overrightarrow{s}$ with size n, there are at least 3^n possible alignments if we look at the possibilities when aligning two sequences we have 3 possibilities for each place:

   - a letter from $\overrightarrow{t}$ and a gap from $\overrightarrow{s}$
   - a letter from $\overrightarrow{s}$ and a gap from $\overrightarrow{t}$
   - a letter from both $\overrightarrow{t}$,$\overrightarrow{s}$

     so for each alignment we have n places to choose and for each place we have 3 options →3*3*3..*3 n times → 3^n

2. (a) Gap_penalty_value= -2 match = +1 mismatch = -1
   sub_similarity($\overrightarrow{t}$,$\overrightarrow{s}$) :
   max = 0
   optimal_loc = null
   //initialize the gap lines
   for i in range |$\overrightarrow{s}$| SIM(i,0) += 0
   for i in range |$\overrightarrow{t}$| SIM(0,j) += Gap_penalty_value
   //fills the SIM table
   for i in range 1- |$\overrightarrow{s}$|:

   - for j in range 1- |$\overrightarrow{t}$|:
     - SIM(i,j) = max { SIM(i-1,j-1) + $\sigma(\overrightarrow{s_i}, \overrightarrow{t_j})$, SIM(i - 1,j) + Gap_penalty_value , SIM(i ,j - 1) + Gap_penalty_value }
     - and mark the square you came from (in order to track back at the end)

   //returns the best sub - sequence score and place in matrix

   max , i_loc= max(SIM(i,|$\overrightarrow{t}$|) for i in range |$\overrightarrow{s}$| (since the optimal seq is found at the last column - makes sure all t is included)

   optimal_loc = (i_loc,|$\overrightarrow{t}$|)

   return max,optimal_loc

   in order to extract the sequence we need to track-back from the optimal_loc

(b)
   Gap_penalty_value= -2 match = +1 mismatch = -1
   sub_similarity($\overrightarrow{t}$,$\overrightarrow{s}$) :
   max = 0
   optimal_loc = null
   //initialize the gap lines
   for i in range |$\overrightarrow{s}$| SIM(i,0) += Gap_penalty_value

for i in range $|\overrightarrow{t}|$ SIM(0,j) += 0
//fills the SIM table
for i in range 1- $|\overrightarrow{s}|$:

- for j in range 1- $|\overrightarrow{t}|$:
  - SIM(i,j) = max { SIM(i-1,j-1) + $\sigma(\overrightarrow{s_i}, \overrightarrow{t_j})$, SIM(i - 1,j) + Gap_penalty_value , SIM(i ,j - 1) + Gap_penalty_value }
  - and mark the square you came from (in order to track back at the end)

  //returns the best sub - sequence score and place in matrix

  max , j_loc= max(SIM($|\overrightarrow{s}|$,i) for j in range $|\overrightarrow{t}|$ (since the optimal seq is found at the last line - makes sure all s is included)

  optimal_loc = ($|\overrightarrow{s}|$,j_loc)

  return max,optimal_loc

  in order to extract the sequence we need to track-back from the optimal_loc