**WST540: Exercise 5**

**Problem 1.** Let $s = \text{solver}$ and $t = \text{lovely}$. Answer the following questions.

(i) Recall that, to compute the edit distance between $s$ and $t$, we learned a dynamic programming algorithm which works by filling in a 2d array $A$, such that $A[i,j]$ $(0 \leq i, j \leq 6)$ equals the edit distance between $s[1..i]$ and $t[1..j]$. Give the entire $A$ in its final form.

(ii) Remember that each cell in $A$ is determined by at least one other cell (where the notion of “determine” is as defined in Lecture 13). Give all the cells that can determine $A[3,4]$. Repeat this for $A[2,5]$ and $A[4,3]$.

(iii) Give a trace for $s$ and $t$ that corresponds to an editing path that changes $s$ to $t$ with the minimum operations. Also explain what are these operations.

**Problem 2.** Let $s$ and $t$ be as defined in Problem 1. Suppose that we only want to verify whether the edit distance between $s$ and $t$ is greater than 1. Give the values of the cells of $A$ that need to be computed by the algorithm in Lecture 14.

**Problem 3.** Let $s = \text{father}$ and $t = \text{feather}$. Answer the following questions for $q = 3$:

(i) List all the positional $q$-grams of $s$ and $t$.

(ii) Let $d = 1$. Give the number of positional $q$-grams of $t$ that $d$-match at least one positional $q$-gram of $s$. List those $q$-grams of $t$.

**Problem 4.** Let $s$ be a string of length 6, and $t$ a string of length 7. Fix $d = 2$ and $q = 2$. Let $x$ be the number of positional $q$-grams of $s$ that $d$-match at least one positional $q$-gram of $t$. Answer the following questions.

(i) If $x = 2$, can the edit distance of $s$ and $t$ be at most $d$? If not, explain why; otherwise, justify your answer with an example of $s$ and $t$.

(ii) If $x = 3$, can the edit distance of $s$ and $t$ be at most $d$? If not, explain why; otherwise, justify your answer with an example of $s$ and $t$. 