6. Draw the full suffix tree for ananas$. Add suffix links (labeled with an arrow with a dashed edge).

7. If slowscan is used alone to build a suffix tree, in the worst-case scenario how many characters must be compared when inserting suffix $S_i$? Ignore the cost of the first mismatching character.

8. Using the suffix lemma, at least how many characters will fastscan match? Given $|\text{head}_{i-1}| = k$, an insert of $S_i$ fastscan will match $k-1$ characters.

9. Assuming fastscan is run first and the result of fastscan are used as the starting point for slowscan, what is the maximum number of characters that must be compared by slowscan? Ignore the cost of the first mismatching character. Given $|\text{head}_{i-1}| = k$, $|\text{head}_i| > k-1$. Then the max number of characters compared by slowscan is $|\text{head}_i| - (|\text{head}_{i-1}| - 1)$.

10. Assuming fastscan is run first (as in the previous question), what will be the total runtime of all slowscan searches?

$$\sum_{i=1}^{n} |\text{head}_i| - |\text{head}_{i-1}| + 1$$

$$= |\text{head}_n| - |\text{head}_0| + n$$

$$= O(n)$$

where $n$ is the number of headings.
11. Draw the suffix tree for the string "ababaabb#ababaaba8". Circle all internal nodes that have suffix descendents that contain the '#' character. Draw a star next to all internal nodes that have suffix descendents that do not contain the '#' character.

12. What is the largest common substring in both "ababaabb" and "abaababa"?

   abaab, abaab

13. For a non-root internal node \( u \) in a suffix tree, what is the change in node depth from following its suffix link? I.e., \( \text{depth}(u) - \text{depth}(\text{link}(u)) \geq \text{depth}(u) - 1 \)

14. \( u \) is an internal node in a suffix tree with \( \text{label}(u) = \text{"abcxyz"} \). What is \( \text{label}(\text{link}(u)) \)?

\[ \text{b\text{x}y} \]

15. Using \( u \) from the previous question, what is one possible \( \text{label}(\text{parent}(u)) \)?

\[ \text{ay} \]

16. Consider the following string: "evil is a name of a foeman and it is open on one position. telegram margelet! no mists or frost you are too hot to hoot. you are nothing like those senile felines."

Remove all whitespace from the string. Then, use the LCS solver in the notes to find the largest palindrome it contains.

   "it is open on one position"
HW: Suffix Tree

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1. The string $S = \text{ananasi}$, where $S_0 = \text{ananasi}$, $S_1 = \text{nasi}$, … What is $S_3$?

   $S_3 = \text{nasi}$

2. Insert the first 2 suffixes, $S_0$, $S_1$ into a suffix tree and draw the tree thus far. When inserting $S_2$, what is $\text{head}_2$?

   $\text{head}_2 = \text{ana}$

3. Using the suffix lemma, what guarantee does $\text{head}_2$ give about $\text{head}_3$?

   $|\text{head}_3| \geq |\text{head}_2| - 1$

4. Insert the first 3 suffixes, $S_0$, $S_1$, $S_2$ into a tree and draw the tree. What is $\text{head}_3$?

   $\text{head}_3 = \text{na}$

5. If a string $T = xA$ (where $x$ is a character and $A$ is a string of arbitrary length), $\text{loc}(T) = u$ where $u$ is the node with $\text{label}(u) = T$. What is $\text{label}(\text{link}(\text{loc}(T)))$?

   $A$