

# CSCA48 Assignment 3

Due: April 1, 2018. 11:59pm

To account for the fact that this assignment must be done in *one day*, we will make it relatively simple. Complete 3 (or more) of the 5 problems, but only 3 will be marked by a human.

## match\_mask revisited

Our friends, the marine biologists from A08 were not too pleased with the results of your solutions for their nucleotide project. They claimed that your `match_mask()` function was too ugly. Reimplement it using recursion.

## More FormulaTrees!

It turns out `FormulaTrees` can be used more elegantly. Given a formula tree with the operators (`+`, `*`, `/` and `_` for `ln`), the leaf  $x$  being a variable, and all other possible leaves as constant, make the function `differentiate(formula_tree)` that returns the derivative of the input. Use leaves that have a number for a symbol to specify constants that the user has not given.

## Sorts, Sorts, Sorts!

Implement either `selection_sort()` or `quick_sort()` with the SLL used in the lectures. If you do both, it counts as 2 of the 5.

BONUS: Do in-place quicksort.

## For a Thousand Dollars

Show whether or not any non-deterministic algorithm in polynomial time can be reduced to a deterministic algorithm in polynomial time. We will give you 1K for solving this.

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