3510 Homework 3: More DP practice.
Due: Thursday, September 5, 2019 before noon EST via Gradescope.

There are 5 problems, but we will only collect three problems, namely problems 1, 4, and 5 (and we will probably only grade a subset of those three, not all of them). We won’t collect problems 2, and 3. Homeworaks are not worth much so don’t stress if you can’t finish by the deadline. These are for practice so you can still work on it after the deadline. Get a study group together and work on it independently, but then you can help each other out when someone’s stuck and you can check each other’s solution (grading and teaching is the best way to master the material).
Problem 1  [DPV] 6.8 (Longest common substring)

(Faster (and correct) in asymptotic $O(\cdot)$ notation is worth more credit.)

(a) Define the entries of your table in words. E.g., $T(i)$ or $T(i, j)$ is ....

(b) State recurrence for entries of table in terms of smaller subproblems, and briefly explain in words why it is correct.
(c) Write pseudocode for your algorithm to solve this problem.

(d) Analyze the running time of your algorithm.
(e) Don’t turn-in this part. In class we did longest common subsequence. How does the subproblem definition and the recurrence differ between the two problems: longest common subsequence vs. substring.
Problem 2  [DPV] 6.17 Change making v1 – unlimited supply

(Faster (and correct) in asymptotic $O(\cdot)$ notation is worth more credit.)

(a) Define the entries of your table in words. E.g., $T(i)$ or $T(i, j)$ is ....

(b) State recurrence for entries of table in terms of smaller subproblems, and briefly explain in words why it is correct.
(c) Write pseudocode for your algorithm to solve this problem.

(d) Analyze the running time of your algorithm.
Problem 3  [DPV] 6.18 Change Making v2 – at most once

(Faster (and correct) in asymptotic $O(\cdot)$ notation is worth more credit.)

(a) Define the entries of your table in words. E.g., $T(i)$ or $T(i, j)$ is ....

(b) State recurrence for entries of table in terms of smaller subproblems, and briefly explain in words why it is correct.
(c) Write pseudocode for your algorithm to solve this problem.

(d) Analyze the running time of your algorithm.
Problem 4  [DPV] 6.19 Change v3 – unlimited supply, but use $\leq k$ coins

(Faster (and correct) in asymptotic $O(\cdot)$ notation is worth more credit.)

(a) Define the entries of your table in words. E.g., $T(i)$ or $T(i,j)$ is ....

(b) State recurrence for entries of table in terms of smaller subproblems, and briefly explain in words why it is correct.
(c) Write pseudocode for your algorithm to solve this problem.

(d) Analyze the running time of your algorithm.
Problem 5  [DPV] 6.7 Palindrome Subsequence

For extra practice, try palindrome string as well.
(Faster (and correct) in asymptotic $O(\cdot)$ notation is worth more credit.)
(a) Define the entries of your table in words. E.g., $T(i)$ or $T(i, j)$ is ....

(b) State recurrence for entries of table in terms of smaller subproblems, and briefly explain in words why it is correct.
(c) Write pseudocode for your algorithm to solve this problem.

(d) Analyze the running time of your algorithm.