

Algorithm Design and Analysis
CS 376, Spring 2023

Smaller Assignment 9

Due **BY THE BEGINNING OF CLASS** Wednesday, April 26

- For this Smaller Assignment, the standard conventions apply: Please submit your typewritten answers in a PDF file named

CS376_SA9_<userid>.pdf

where <userid> is replaced by your Colby userid. **Please be sure to give your full userid, including the numbers representing your class year.**

To submit this assignment, place the properly named file in your **Private** directory in your CS376 filesystem on **filer**. **Please make sure all Problem Set and Smaller Assignment submissions are to your Private folders!**

- *A general note for CS376:* When writing up your homework, **explain your answers clearly and thoroughly**, giving all details needed to make your answers easy to understand. Clear communication *is* the point, on every assignment.

Unless explicitly specified otherwise, answers in CS376 should be accompanied by explanations; as part of this, in general, when you present an algorithm, give an accompanying correctness argument. Answers without convincing explanations that show command of the relevant concepts may not receive full credit. Please feel free to ask me any questions about explanations that might come up!

Exercises

1. CLRS exercise 25.2-1 (pg. 699). This exercise is intended to give you practice with the Floyd-Warshall algorithm. For your answer, please show all of the requested matrices, and please do the work by hand; implementing code to get this output defeats the purpose of the exercise.

For this exercise, although it is not necessary to explain *all* your work, please give short explanations (1–2 sentences) of the following:

- One instance where a matrix value is different in $D^{(1)}$ than in its corresponding index in $D^{(0)}$, and
- one instance where a matrix value is different in $D^{(5)}$ than in its corresponding index in $D^{(4)}$.

Other than that, no other explanation of your answer is necessary.

L^AT_EX notes: The L^AT_EX that I use for these matrices requires a font package such as `amsmath` for the ∞ symbol, so I put `\usepackage{amsmath}` before `\begin{document}` in my file. Then, this L^AT_EX code would give the output that follows.

```
{\footnotesize
$
D^{(0)} = \begin{pmatrix}
\infty & \infty & \infty & \infty & \infty & \infty\end{pmatrix}
```

```

\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty
\end{pmatrix}
$
\hspace*{3mm}
\vspace*{12pt}
$
D^{(1)} = \begin{pmatrix}
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty
\end{pmatrix}
$
\\

$
D^{(2)} = \begin{pmatrix}
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty
\end{pmatrix}
$
\hspace*{3mm}
\vspace*{12pt}\vspace*{20pt}
$
D^{(3)} = \begin{pmatrix}
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty\\
\infty & \infty & \infty & \infty & \infty & \infty
\end{pmatrix}
$
} % close of footnotesize

```

[illegible]

[illegible]