Percolation Project
Math 242
due Friday, April 26

We have been examining the 2-D percolation problem in which we have a $n \times n$ grid of squares. Each square is either "open" with probability p or "closed" with probability $1 - p$. We say that percolation occurs if there is a path of open squares from any square in the top row to any square in the bottom row of the grid.

Your Task

Investigate the following two questions:

1. How does the probability of percolation depend on p?

2. How does the probability of percolation depend on n?

Provide computational evidence and plots to support your answers.

Your Report

Turn in *either* a Mathematica notebook or a Python Colab notebook saved as a PDF file. To save your Colab notebook as a PDF file, go to File → Print, and choose destination "Save as PDF". Make sure that you clearly answer the questions above, and include computations to support your answers. As usual, submit code that runs and explain what your code does. Your goal should be to communicate your work to another person (e.g., another student at your level who is not in this course).

Grading Rubric

Your notebook will be graded on a scale of 0 to 16 points. The following rubric gives characteristics of notebooks that will merit sample point totals. (Interpolate the following for point totals that are not divisible by 4.)

16 points. Questions and goals are clearly stated, including relevant definitions or parameters. Computations are complete; code runs and is clearly explained. Conclusions are clearly stated and backed up by sufficient computational evidence. Limitations of the methodology, extensions for future work, and conjectures are discussed. Notebook is well-formatted and easy to read.

12 points. Questions and goals are stated well, though relevant definitions or parameters may be missing. Computations are mostly complete; code runs, but explanation is weak. Conclusions are unclear or not well justified. Insufficient discussion of limitations, extensions, and conjectures.

8 points. Statement of questions or goals is unclear. Computations are incomplete; explanation is ambiguous. Code may produce errors when run. Conclusions are possibly correct, but not justified. Little or no discussion of limitations, extensions, or conjectures. Notebook is difficult to read.

4 points. Serious misunderstanding of the questions or goals. Computation is inadequate for the task at hand. Work is not clearly explained. No discussion of limitations, extensions, or conjectures. Notebook is difficult to read.

0 points. Notebook is not turned in.