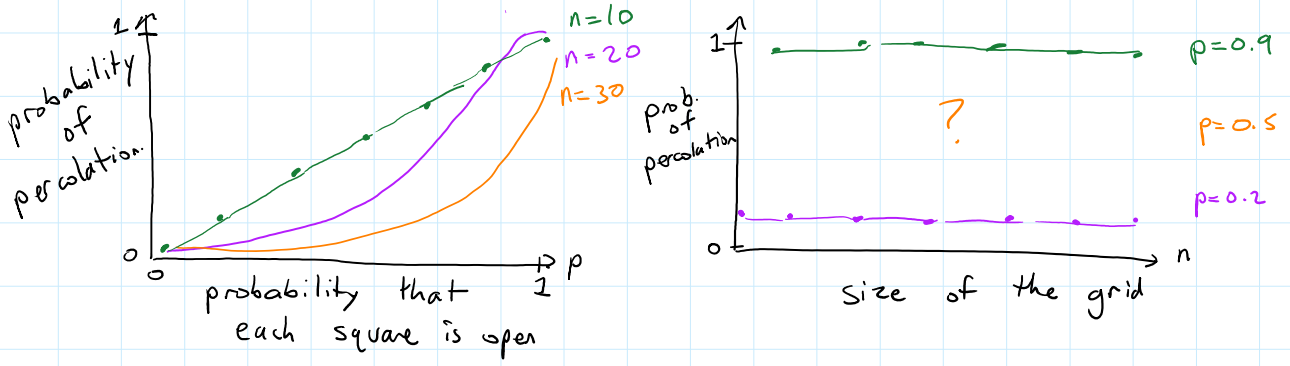
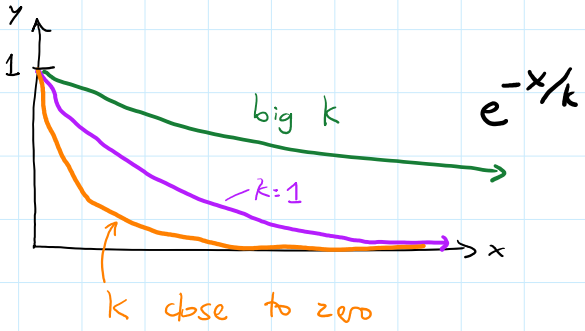
Percolation Project: How does the probability of percolation depend on p and n?



WARM-UP: Consider $e^{-x/k}$ for $x>0$.

How does the shape of the graph of $e^{-x/k}$ depend on k? $k>0$.



PROBLEM: Suppose we have a function $f: \Omega \to \mathbb{R}$.

The domain Ω is high-dimensional and very large, and f is complicated.

We want to find $x \in \Omega$ that minimizes $f(x)$.

We can't draw a graph of f or use calculus.

How can we find a min. value? Even an approximate min.?

IDEA: Use a random walk on Ω.

Start at a random location.

At each time step, the walk proposes a move.

If the proposed move goes to a smaller value of f, then the move is made.

If the proposed move goes to a larger value of f, the walk might or might not make the move.

The longer this process proceeds, the less likely the walk is to move to a larger value of f.

This process is called SIMULATED ANNEALING.

It's a Markov Chain Monte Carlo method. (MCMC)