Ancilla Purification:

Start with $N$ ancillas
1. Do bit flip verification (have $N/3$ ancillas)
2. Do phase EC (have $N/9$ ancillas)
3. Do bit flip verification (have $N/27$ ancillas)

\[
p \rightarrow 3p^2 \rightarrow 9p^2 \rightarrow 243p^4 \rightarrow \ldots \rightarrow (9p)^{2^n}/9
\]

So if $p < \frac{1}{9}$ approach 0 quickly. Important that it is quick since we are losing ancillas quickly.

If there are errors in gates, the logical error rate asymptotes to some value - given by roughly the probability that a single round fails by itself.

Assumptions on Error Model and Circuits:

Let us examine which of the assumptions on the error model are truly necessary:

With local gates, we still have a threshold (see problem set 5).

Parallel operations:
- consider storage and gate errors
- with 3 qubit ops, so qubit must wait time $N/3$ (with $N$ qubits in computer) between gates.
For large enough $N$, EC will be impossible
- necessary for threshold

Fresh ancillas (necessary)

Classical computation:
- implement with quantum circuit. But error could cause multiple errors in data block.
- implement using classical FT (repetition code)
- not necessary for threshold