

3. Grover iteration

$$G = (2|\psi\rangle\langle\psi| - \mathbb{I})O,$$

where

$$O = |\alpha\rangle\langle\alpha| - |\beta\rangle\langle\beta|$$

$|\psi\rangle$ is the equal superposition

4. Circuit identities

$$C^2 = \mathbb{I}$$

$$Y = iXZ$$

5. Measuring an operator

HINT: write U in the spectral decomposition form