

<u>Deutsch's Problem</u>: Given query access to f, f is flat or sloped determine if (circuit diagram) . time goes L>R . Mires are bits A Classical Algorithm · Wires are bits · Shapes are gates 1 2> flat 0 => sloped NOT AND OR Query Complexity = 2 Time Complexity = 5, 8, time complexity of f?

What is the minimum number of classical gueries to f needed to determine flat/sloped

B) <u>1</u> C) 2 $(A) \bigcirc (A)$

Deutsch's Problem · Classical Query Complexity 2 · Quantum Query Complexity: 1 Why do we care?! - Provable guantum - Techniques computing advantage - Might be useful if f is really hard to compute

Need gate for f. What a bout: f(0) = f(1) = 0 $\frac{1}{2} | 0 \rangle \rightarrow | f(0) \rangle$ (0)-> (0) ··· f [- 10> - [f-1] $|1\rangle \rightarrow |f(1)\rangle$ 17-107 Explain why this is not an allowed gate. (State > State, Reversible) Instead: Mterpretation : $\langle 0 \rangle \langle 0 \rangle \rightarrow$ $|0\rangle|1\rangle \rightarrow$ $|1\rangle|0\rangle \rightarrow$ 117/17 ->