Given a string S of '(' and ')' parentheses, we add the minimum number of parentheses ( '(' or ')', and in any positions ) so that the resulting parentheses string is valid.

Formally, a parentheses string is valid if and only if:

* It is the empty string, or
* It can be written as AB (A concatenated with B), where A and B are valid strings, or
* It can be written as (A), where A is a valid string.

Given a parentheses string, return the minimum number of parentheses we must add to make the resulting string valid.

**Example 1:**

**Input:** "())"

**Output:** 1

**Example 2:**

**Input:** "((("

**Output:** 3

**Example 3:**

**Input:** "()"

**Output:** 0

**Example 4:**

**Input:** "()))(("

**Output:** 4

**Note:**

1. S.length <= 1000
2. S only consists of '(' and ')' characters.