原始问题

The value of the expression \[(3^{1001}+4^{1002})^2-(3^{1001}-4^{1002})^2\]is $k\cdot12^{1001}$ for some positive integer k. What is k?

```
def solution():
    # Define the variables
    a = 3**1001
    b = 4**1002

    # Using the identity (a+b)^2 - (a-b)^2 = 4ab
    expression = (a + b)**2 - (a - b)**2
    simplified_expression = 4 * a * b  # Since a = 3^1001 and b = 4^1002

    # Factor out 12^1001 from the expression
    # 12^1001 = (3*4)^1001 = 3^1001 * 4^1001
    # We rewrite 4^1002 as 4^1001 * 4, so the expression becomes:
    # 4 * 3^1001 * 4^1001 * 4
    # = 4^2 * 3^1001 * 4^1001
    # = 16 * 12^1001

    # k is the factor in front of 12^1001, which is 16
    k = simplified_expression / (12**1001)

    return k
```

evolve 1

数值增强

```
def solution():
    # Define the variables
    a = 5**1503
    b = 6**1504

    # Using the identity (a+b)^2 - (a-b)^2 = 4ab
    expression = (a + b)**2 - (a - b)**2
    simplified_expression = 4 * a * b  # Since a = 5^1503 and b = 6^1504

    # Factor out 30^1503 from the expression
    # 30^1503 = (5*6)^1503 = 5^1503 * 6^1503
    # We rewrite 6^1504 as 6^1503 * 6, so the expression becomes:
    # 6 * 5^1503 * 6^1503 * 6
    # = 6^2 * 5^1503 * 6^1503
    # = 36 * 30^1503
```

```
    # k is the factor in front of 30^1503, which is 36
    k = simplified_expression / (30**1503)

    return k
```

正确

逻辑加强

- 逻辑链路断了，明显不太合理。
- 原始问题的生成质量对我们来说很重要。

```
def solution():
    # Define the variables
    a = 3**1001
    b = 4**1002

    # Using the identity (a+b)^2 - (a-b)^2 = 4ab
    expression = (a + b)**2 - (a - b)**2
    simplified_expression = 4 * a * b  # Since a = 3^1001 and b = 4^1002

    # Factor out 12^1001 from the expression
    # 12^1001 = (3*4)^1001 = 3^1001 * 4^1001
    # We rewrite 4^1002 as 4^1001 * 4, so the expression becomes:
    # 4 * 3^1001 * 4^1001 * 4
    # = 4^2 * 3^1001 * 4^1001
    # = 16 * 12^1001

    # k is the factor in front of 12^1001, which is 16
    # Adding a constraint related to the properties of powers of 3 and 4
    factor = (3**1001) * (4**1002) / (12**1001)

    # Introducing a slight variation by considering a related mathematical
identity:
    result = factor * 2  # Scaling the factor by 2

    return result
```