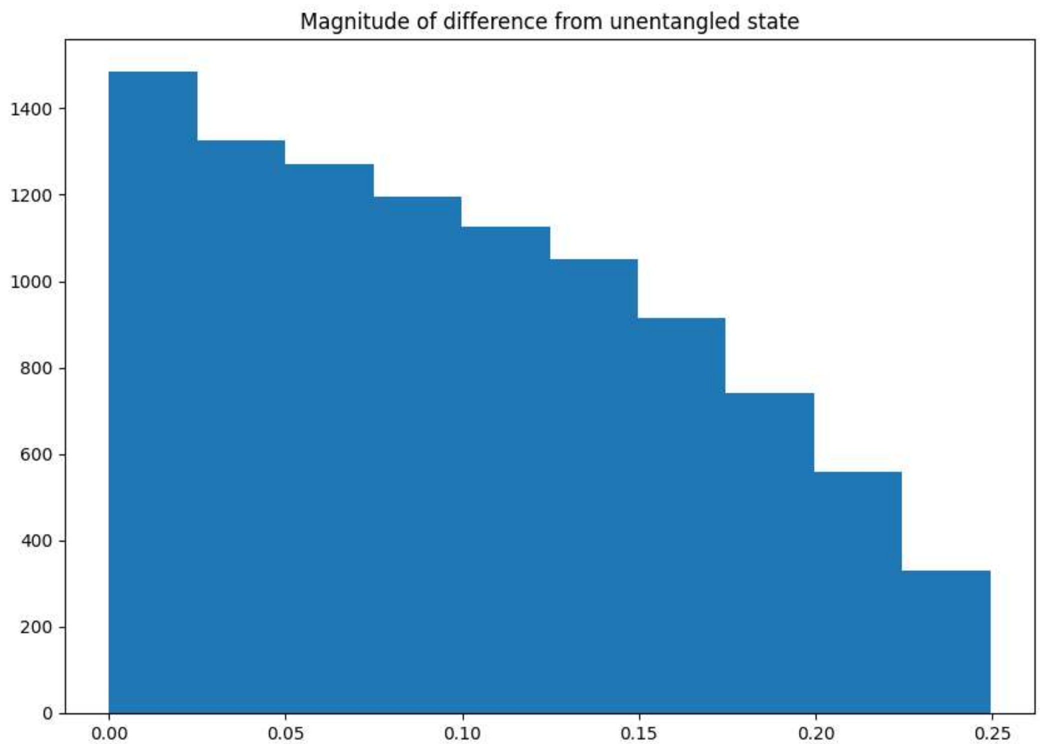
```
import math
import numpy
import matplotlib.pyplot as plt

import qConstants as qc
import qUtilities as qu

differences = [0] * 10000

for i in range(10000):
    ket_psi = qu.uniform(2)
    complex_diff = (ket_psi[0] * ket_psi[3]) - (ket_psi[1] * ket_psi[2])
    diff_psi = abs(numpy.conj(complex_diff) * complex_diff
    differences[i] = diff_psi

differences.sort()
fig = plt.figure(figsize = (10, 7))
plt.hist(differences)
plt.title("Magnitude of difference from unentangled state")
plt.savefig("untentangled_hist.png")

print("Percentiles of differences:")
print("0%:", differences[0])
print("10%:", differences[999])
print("25%:", differences[2499])
print("50%:", differences[4999])
```



This histogram indicates that almost all of the randomly generated states failed to meet the entanglement equation by a difference of at least ~0.01. To support this, some of the percentiles of this simulated data are shown below:

```
aokib@DESKTOP-3FLHKNH:/mnt/c/Users/aokis/Documents/cs358$ python3 2qbit_entanglement_test.py
Percentiles of differences:
0%: 2.2426185054390396e-05
10%: 0.017060969907373495
25%: 0.04343085903576944
50%: 0.09369177645260898
```

Based on these percentiles, 90% of all the simulated states had mismatches of at least 0.017, which seems larger than could be caused by floating-point imprecision. Also, 75% of the simulated states had mismatches of at least 0.043, which is certainly larger than could be caused by imprecision. Thus these results support the claim that almost all two-qbit states fail to satisfy the entanglement equation.