A Numerical Experiment on Fermat's Theorem
(not intended as formal proof or disproof)

V. Christianto (vxianto@yahoo.com)
F. Smarandache (fsmarandache@yahoo.com)

Fermat's "Last Theorem" asserts that if \( n > 2 \), the equation
\[
x^n + y^n = z^n
\]
cannot be solved in integers \( x, y, z \), with \( xyz \neq 0 \):

**Theorem:**
For any triplets of numbers \( (a,b,c) \) obeying Pythagorean theorem
we have \( a^n+b^n=c^n \).

It perhaps could be shown (numerically) that:
\[
a^n+b^n=c^n,
\]
or:
\[
(a^n+b^n)/c^n=k = 1
\]
(Fermat's Surface)
holds true if and only if \( n=2 \).
(Generalized Fermat's Last Theorem)

First try: 3, 4, 5 \( (3^2 + 4^2 = 5^2) \)
Second try: 5, 12, 13 \( (5^2+12^2=13^2) \)
Third try: 6, 8, 10 \( (6^2 + 8^2 = 10^2) \)
Fourth try: 1, 2, \( \sqrt{5} \) \( (1^2 + 2^2 = 2.236^2) \)

<table>
<thead>
<tr>
<th>( n )</th>
<th>First try</th>
<th>Second try</th>
<th>Third try</th>
<th>Fourth try</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td>3, 4, 5</td>
<td>5, 12, 13</td>
<td>8, 15, 17</td>
<td>1, 2, ( \sqrt{5} )</td>
</tr>
<tr>
<td>-4</td>
<td>10.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-3</td>
<td>6.58</td>
<td>11.05</td>
<td>12.58</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td>4.34</td>
<td>7.93</td>
<td>5.80</td>
<td>6.25</td>
</tr>
<tr>
<td>-1</td>
<td>2.92</td>
<td>3.68</td>
<td>3.26</td>
<td>3.35</td>
</tr>
<tr>
<td>0</td>
<td><strong>2.00</strong></td>
<td><strong>2.00</strong></td>
<td><strong>2.00</strong></td>
<td><strong>2.00</strong></td>
</tr>
<tr>
<td>1</td>
<td>1.40</td>
<td>1.31</td>
<td>1.35</td>
<td>1.34</td>
</tr>
<tr>
<td>2</td>
<td><strong>1.00</strong></td>
<td><strong>1.00</strong></td>
<td><strong>1.00</strong></td>
<td><strong>1.00</strong></td>
</tr>
<tr>
<td>3</td>
<td>0.73</td>
<td>0.84</td>
<td>0.79</td>
<td>0.81</td>
</tr>
<tr>
<td>4</td>
<td>0.54</td>
<td>0.75</td>
<td>0.66</td>
<td>0.68</td>
</tr>
<tr>
<td>5</td>
<td>0.41</td>
<td>0.68</td>
<td>0.56</td>
<td>0.59</td>
</tr>
<tr>
<td>6</td>
<td>0.31</td>
<td>0.62</td>
<td>0.48</td>
<td>0.52</td>
</tr>
<tr>
<td>7</td>
<td>0.24</td>
<td>0.57</td>
<td>0.42</td>
<td>0.46</td>
</tr>
<tr>
<td>8</td>
<td>0.18</td>
<td>0.53</td>
<td>0.37</td>
<td>0.41</td>
</tr>
<tr>
<td>9</td>
<td>0.14</td>
<td>0.49</td>
<td>0.33</td>
<td>0.37</td>
</tr>
<tr>
<td>10</td>
<td>0.11</td>
<td>0.45</td>
<td>0.29</td>
<td>0.33</td>
</tr>
<tr>
<td>11</td>
<td>0.09</td>
<td>0.41</td>
<td>0.25</td>
<td>0.29</td>
</tr>
</tbody>
</table>
Conclusions:

(i) It is clear from the diagram that for the triplets (3,4,5) and (5,12,13) k=1 only at n=2.
(ii) For other triplets of numbers it perhaps does not obey the same formula.
(iii) But generally speaking, from the Chart given below it appears that:
   => For n < 2 --> k tends > 1;
   => For n > 2 --> k tends < 1.
(iv) For triplets of numbers (a,b,c), which do not follow the Pythagorean Triangle (> 180 degrees or < 180 degrees), i.e. when the triangle is on curved-surface, then Fermat theorem could be broken.
(v) We can make an 'associated condition': for the same triplets of (a,b,c) following Pythagorean theorem $a^2+b^2=c^2$, it follows that for n=0 then $(a^n+b^n)/c^n=k$ will yield $k=2$ (of course).

Numerical Test on Fermat's Theorem
References (for similar simplified proof of Fermat's Theorem):


(Jan. 18, 2006)