An Instant Proof of $e^\pi > \pi^e$

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Letting $x = \pi - y$ in

$$e^x > \left(1 + \frac{x}{y}\right)^y$$

(which holds for x, y both positive) and then taking $y = e$ yields $e^{\pi - e} > (\pi/e)^e$, or $e^\pi > \pi^e$.

Realization of Parity Visits in Walking a Graph

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In a hamiltonian graph G, there exists a closed walk W which visits each point exactly once. To generalize this phenomenon, we shall show that in any connected graph G there is a walk W_1 which visits each point an odd number of times and another walk W_2 which does this an even number of times. The novelty of our short proof is that it is accomplished by using a standard elementary technique of computer science, the *depth first search*, to obtain a new modest observation in graph theory.

A *walk* in a graph is a sequence of points where consecutive pairs of points are joined by a line in the graph. A *cycle* is a walk with at least three points in which the first and last points are the same and no other point is repeated. A connected graph which contains no cycles is a *tree*. It is well known that every connected graph has a *spanning tree* which is a tree containing all the points of the graph. The tree of Figure 2, for example, is a spanning tree of the graph G in Figure 1. Our graph theoretic terminology follows that of F. Harary's *Graph Theory*, Addison-Wesley, Reading, 1969.

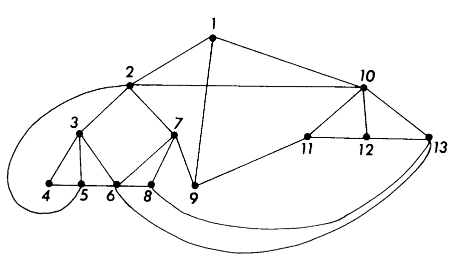

Figure 1. A graph G.

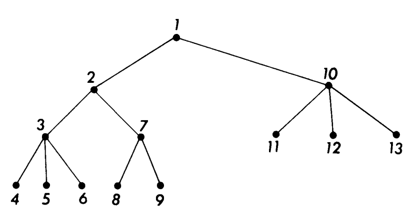

Figure 2. A spanning tree for graph G.

Our main result is illustrated by the following two observations for the tree T of Figure 2:

The walk 1, 2, 3, 4, 3, 5, 3, 6, 3, 2, 3, 2, 7, 8, 7, 9, 7, 2, 1, 2, 1, 10, 11, 10, 12, 10, 13, 10, 1, 10, 1 visits each point an odd number of times.

The walk 2, 3, 4, 3, 4, 3, 5, 3, 5, 3, 6, 3, 6, 3, 2, 3, 2, 7, 8, 7, 8, 7, 9, 7, 9, 7, 2, 7, 2, 1, 10, 11, 10, 11, 10, 12, 10, 12, 10, 13, 10, 13, 10, 1, 10, 1, 2, 1 visits each point an even number of times.