Starmind Solution

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Complex number problem

http://www.starmind.com/question/1182/

Abstract: A simple algebraic derivation of the answer, starting from a geometric consideration of the complex plane.

First, see that e^ix = i, where x=?/2 + 2n? for each integer n, as mutiplication (of 1) by ?/2 is a quarter-turn anti-clockwise around the conventional geometric map of the complex plane, and then any other rotation of 2n? will give the same value.

Then raising both sides to the power i, we get

e^iix = i^i, (concretely e^ii(?/2 + 2n?) = i^i) and e^-x = i^i.

So i^i = e^-x, where x = ?/2 + 2n?, for each integer n. The expression is multivalued, and real for each value that is takes (as it involves only real constants). Taking n=0 gives 0.207879576.... as the principle value.

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