

Xenomathematics

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1 What is Xenomathematics?

A venerable question about mathematics is whether it is invented or discovered. The discipline of Xenomathematics can be viewed as a variation on that theme. Xenomathematics is the consideration of mathematical systems that might develop among other intelligent beings.

By its nature, of course, Xenomathematics is a speculative discipline. One can imagine societies that develop scientifically without certain concepts we consider fairly basic (see for example Fredonia, where the real numbers have never been conceived; all calculations are done with rational numbers); or one can argue that, to achieve approximate technological parity with our current civilization, it is highly likely that they use certain parts of our mathematics. Is calculus probably necessary before interplanetary travel can be achieved? What about quadratic reciprocity?

2 Other Directions

Xenomathematics could be divided into the consideration of worlds that are more or less like our own. M-class Xenomathematics would consider mathematical systems developed on earth-like worlds by humanoids with approximately our intelligence, physical shape, and level of technological advance.

More exotically, one could consider what mathematics would be done by a race much more intelligent than humans. Would most of our deep theorems

seem tautological, or would some still remain interesting? What mathematical questions would excite them? What about a race with somewhat lower intelligence, but a long-lasting society — could they slowly ratchet up to what we consider advanced mathematics?

What would be the impact of different biology — would intelligent planaria have a very different approach to fluid mechanics? What about plasma-based organisms living inside stars? If smell or sound rather than sight were the primary sense, would planar geometry seem very esoteric? Think of dolphins, for example. What mathematics might they develop first?

Expanding further, what if the laws of chemistry or physics changed? If Planck's constant in Séimhiúmór were so large that quantum mechanical effects were obvious on a macroscopic scale, would their *Philosophiæ Naturalis Principia Mathematica* be more about Operator Theory than calculus?