Flanders Math Olympiad 1994

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by Peter

1 Let $a, b, c > 0$ the sides of a right triangle. Find all real x for which $a^x > b^x + c^x$, with a is the longest side.

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2 Determine all integer solutions (a,b,c) with $c \leq 94$ for which: $(a+\sqrt{c})^2 + (b+\sqrt{c})^2 = 60 + 20\sqrt{c}$

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3 Two regular tetrahedrons A and B are made with the 8 vertices of a unit cube. (this way is unique)

What's the volume of $A \cup B$?

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4 Let (f_i) be a sequence of functions defined by: $f_1(x) = x, f_n(x) = \sqrt{f_{n-1}(x)} - \frac{1}{4}$. ($n \in \mathbb{N}, n \geq 2$)
(a) Prove that $f_n(x) \leq f_{n-1}(x)$ for all x where both functions are defined.
(b) Find for each n the points of x inside the domain for which $f_n(x) = x$.
