

Austria Beginners' Competition 2008

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by parmenides51

- 1 Determine all positive integers n such that $\frac{2^n}{n^2}$ is an integer.
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- 2 Determine all real numbers x satisfying

$$x[x[x]] = \sqrt{2}.$$

- 3 Prove the inequality

$$\frac{a+b}{a^2-ab+b^2} \leq \frac{4}{|a+b|}$$

for all real numbers a and b with $a+b \neq 0$. When does equality hold?

- 4 Let ABC be an acute-angled triangle with the property that the bisector of $\angle BAC$, the altitude through B and the perpendicular bisector of AB intersect in one point. Determine the angle $\alpha = \angle BAC$.
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