SymmeTree Contest 1 - Bonus

Problem 1. Let a, b, c, x, y, z be positive reals such that $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$. Prove that

$$a^x + b^y + c^z \geq \frac{4abcxyz}{(x + y + z - 3)^2}$$

Problem 2. Let the incircle of ΔABC touch side BC, CA, AB at D, E, F and I be the incentre of ΔABC. EF meets the circumcircle of ABC at P, Q and QD meets the circumcircle of ABC at R. Prove that $AR \perp PI$.