

Rules:-

- Submit your solutions only as a PDF document.
 - Mention your Name, E-mail id (College email id preferable), College Address and Contact Details clearly along with the solutions (**in the same document**).
 - Submissions with out the above details will not be evaluated.
 - Submit your solutions on or before 9th September, 2006 night by 10.00 P.M
 - Strictly one *final* entry per participant will be accepted.
 - Send your solutions to onlinemaths@shastra.org
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Problems

- 1) Show that $\sqrt{x} + \sqrt{y} + \sqrt{z} \geq xy + yz + zx$ for positive reals x, y, z with sum 3.
- 2) Show that $\sin^2 x + (\sin^n x - \cos^n x)^2 \leq 1$.
- 3) If $a+b+c=0$, show that $2(ab+bc+ca)^4 = a^4(b-c)^4 + b^4(c-a)^4 + c^4(a-b)^4$
- 4) Find $[1/3] + [2/3] + [2^2/3] + [2^3/3] + \dots + [2^{1000}/3]$.
- 5) The equations $x^2 + ax + 1 = 0$ and $x^2 + bx + c = 0$ have a common real root, and the equations $x^2 + x + a = 0$ and $x^2 + cx + b = 0$ have a common real root. Find $a + b + c$.
- 6) x, y are positive reals such that $x + y = 2$. Show that $x^3 y^3 (x^3 + y^3) \leq 2$.