

Putnam Mathematical Competition

The Putnam Competition takes place in early December (usually the first Saturday). In 2009 this is December 5. This competitive examination is open to regularly enrolled undergraduates in colleges and universities of the United States and Canada.

For details, and to register, please contact

Andrew Török, 672 PGH, 713-743-3478, [torok\[at\]math.uh.edu](mailto:torok[at]math.uh.edu)

For more information, including past problems, see the Putnam link at

www.math.uh.edu/~torok

Please register by **Friday, October 9**.

There will be meetings to discuss problems and related material.

The competition consists of two three-hour sessions (9am-noon and 2-5pm). There are 6 problems in each session, and each problem is worth 10 points.

In 2007 a score of 10 points (1 problem solved) placed a contestant in the top 32%, a score of 20 (2 problems) in the top 14%; ranks are similar for other years.

Here are two problems from each of the 2007 sessions:

- A1 ('07) Find all values of α for which the curves $y = \alpha x^2 + \alpha x + \frac{1}{24}$ and $x = \alpha y^2 + \alpha y + \frac{1}{24}$ are tangent to each other.
- A2 ('07) Find the least possible area of a convex set in the plane that intersects both branches of the hyperbola $xy = 1$ and both branches of the hyperbola $xy = -1$. (A set S in the plane is called *convex* if for any two points in S the line segment connecting them is contained in S .)
- B1 ('07) Let f be a polynomial with positive integer coefficients. Prove that if n is a positive integer, then $f(n)$ divides $f(f(n) + 1)$ if and only if $n = 1$. [Editor's note: one must assume f is nonconstant.]
- B2 ('07) Suppose that $f : [0, 1] \rightarrow \mathbb{R}$ has a continuous derivative and that $\int_0^1 f(x) dx = 0$. Prove that for every $\alpha \in (0, 1)$,

$$\left| \int_0^\alpha f(x) dx \right| \leq \frac{1}{8} \max_{0 \leq x \leq 1} |f'(x)|.$$