Welcome to the Putnam Prep sessions! We will be meeting Thursdays at 5:30pm in RLM 10.176. We can do whatever you want; the goal is simply to prepare you to have the most fun and (we hope) some success at the Putnam competition itself. Save the date in your calendar now: you want to be free on Saturday, Dec 1 2012, from 9am till 5pm. (That's the weekend after classes end and before finals begin.)

I would like to spend time every Thursday working on problems together: I'll propose some, you try to solve them, and we share our solutions. But don't quit when you leave — keep working on the problems we don't finish. The following week you can show us all your solutions.

I'd like to keep the problems on the web, too, and I also want to encourage you to write up solutions to these problems — it's good practice for Exam Day. Send me your solutions and I'll post them on the web! (http://www.math.utexas.edu/users/rusin/Putnam/)

You can reach me at rusin@math.utexas.edu

A word of warning: Putnam problems are HARD. Some of them are also advanced, meaning that if you haven't had at least a course or three beyond Linear Algebra, you might not even understand the question, let alone its solution. There are always "elementary" questions, meaning that a calculus student — and sometimes even a high school student who hasn't even seen calculus — could understand the question. But elementary does not mean "easy". The solutions often require quite a bit of cleverness, and sometimes the solutions require more advanced mathematics than you might guess from the question. So take a deep breath, learn as much math as you can, and keep your spirits up!

If you are currently taking a calculus course, I encourage you to participate in the Bennett competition at the end of this semester. Those questions are significantly more approachable.

OK, here are the first week's problems. This week I've chosen some Putnam- or Putnam-like questions that can at least be *stated* to a freshman Calculus student. (I would not expect a typical freshman to have much idea of how to solve them, though!)

1. Compute this limit:
$$\lim_{x \to 0} \frac{\sin(x + \frac{x^3}{6} + \frac{3x^5}{40}) - x}{x^7}$$

2. Determine whether or not this series converges: $\sum_{n=2}^{\infty} \frac{1}{\ln(n!)}$

3. Show $\sum_{n=1}^{N} \frac{1}{\sqrt{n}} < 2\sqrt{N}$ for all positive integers N.

4. Evaluate $\sum_{n=1}^{\infty} \frac{\sin(n)}{n}$

5. Evaluate this integral: $\int_0^{\pi/2} \frac{dx}{1 + (\tan(x))^7}$