

Putnam E.11

Po-Shen Loh

7 Nov 2012

1 Problems

Putnam 1982/A1. Let V be the region in the Cartesian plane consisting of all points (x, y) satisfying the simultaneous equations

$$|x| \leq y \leq |x| + 3 \quad \text{and} \quad y \leq 4.$$

Find the centroid (\bar{x}, \bar{y}) of V .

Putnam 1982/A2. For positive reals x , let

$$B_n(x) = 1^x + 2^x + 3^x + \cdots + n^x.$$

Prove or disprove the convergence of

$$\sum_{n=2}^{\infty} \frac{B_n(\log_n 2)}{(n \log_2 n)^2}.$$

Putnam 1982/A3. Evaluate

$$\int_0^{\infty} \frac{\tan^{-1}(\pi x) - \tan^{-1}(x)}{x} dx.$$