

Problem Solving Fall 2007

Problem Set #5

1. Let V be the region in the cartesian plane consisting of all points (x, y) satisfying the simultaneous conditions

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

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

2. Evaluate

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

3. Express

$$\sum_{n=1}^{\infty} \sum_{m=1}^{\infty} \frac{1}{m^2 n + n^2 m + 2mn}$$

as a rational number.

4. Determine all polynomials $P(x)$ such that $P(x^2 + 1) = (P(x))^2 + 1$