Intermediate Math Circles
Wednesday, March 8, 2017
Problem Set 5

1. What is the smallest positive integer $x$ for which

$$\sum_{i=1}^{100} ix$$

is a perfect square?

2. Consider a sequence where $t_k = 3^k - 2k + 2$. Calculate $\sum_{k=1}^{n} t_k$.

3. In a geometric sequence, the first term is 7, the last term is 448, and the sum is 889. Find the third term.

4. The sum of the first $n$ terms of a sequence is $n(n + 1)(n + 2)$. What is the 10th term of the sequence?

5. Evaluate the sum $\sum_{i=1}^{28} \left[ \frac{1}{i} - \frac{1}{i + 2} \right]$.

6. Find $9 + 99 + 999 + 9999 + \ldots$ to $n$ terms.