

Math 475 Homework 8

DUE APRIL 16TH, 2010

1. Decimal Fractions.

- (a) Explain carefully why every rational number has either a terminating or repeating expansion. (Hint: long division.)
- (b) In light of the last question, give me a clear way to generate an infinite decimal expansion that does not repeat, thus constructing an irrational number. Be sure I can tell how to generate each digit and also make an argument why it does not repeat.

2. Find a quadratic function that models this data:

IN	OUT
0	-6
1	-1
2	-6
3	-21
4	-46
5	-81

3. Prove that the first difference of an N th degree polynomial has at most degree $N - 1$.
4. Prove an N th degree polynomial has constant N th differences. (Hint: use the last answer.)
5. The n th tetrahedral number is the sum of the first n triangular numbers. (It's also the number of balls in the first n layers of a tetrahedral ball pyramid.) Find a closed formula for it using our analysis of functions and their first, second, third, etc. differences.
6. Write me a formula for the sum of the first n cubes using our difference table analysis.
7. May 11th and 13th will be days when you will present something cool that is math. You will have about 15 minutes. It will be graded on how cool it is and how much we learn from your presentation. Tell me:
 - (a) With whom you plan to partner (size of teams should be between 1 and 3 people)
 - (b) a specific idea (or two) that you have. Keep it short, but give enough detail so I can tell if it's a good or bad idea.