

**Homework 1**

**Due: September 12, 2012, in your discussion section**

PLEASE READ THE INSTRUCTIONS/SUGGESTIONS WRITTEN IN THE SYLLABUS!

Problems from the textbook:

- *I 3.3, Page 19:* 4, 5, 7
- *I 3.5, Page 21:* 3, 4, 6
- *9.6, Page 365:* 1 c), d), e), 2 b), 3 a), e), g)

Additional problems:

1. Show that  $\sqrt[3]{3}$  is not rational.
2. In each of the following three cases find numerical values for  $x$  and  $y$  so that *exactly* one of the two equations is true. (Or show that this is not possible.)
  - (a) First:  $x + y = 5$ ,                      second:  $2x + 2y = 10$ .
  - (b) First:  $x + y = 6$ ,                      second:  $x^2 + y^2 = 36$ .
  - (c) First:  $x + y = 7$ ,                      second:  $x^2 + xy = 7x$ .

BONUS PROBLEM: The binomial theorem states that  $(a+b)^n = \sum_{i=0}^n \binom{n}{i} a^i b^{n-i}$  where  $\binom{n}{k} = \frac{n!}{(n-k)!k!}$ . Use this to compute the following sums explicitly:

$$\sum_{i=0}^{100} \binom{100}{i}, \quad \sum_{i=0}^{200} (-1)^i \binom{200}{i}, \quad \sum_{i=0}^{100} \binom{300}{3i}.$$

DISCLAIMER: It is easy to find the solutions to (some of) these questions. (E.g. the internet, your fellow classmates ...) However, do NOT consult any of these solutions when working on this assignment or you will learn nothing from it and your chance of passing the course will be greatly diminished. If it becomes apparent to the grader that your solution is copied from existing solutions, you will be assigned a grade of zero for lack of originality.