

## ASSIGNMENT 2

ASSIGNMENT 2: DUE FRIDAY, SEPTEMBER 14.

**Reading.** Sections 1.4–2.3 of Biggs.

**Problems.**

- (1) Prove that the following statement is false: For every natural number  $n$ ,  $3^n + 10$  is prime.
- (2) Use the method of proof by contradiction to prove that 29 is not even.
- (3) Write each of the following sets in set-builder ( $\{x|\dots\}$ ) notation:
  - (a) The set of even perfect squares.
  - (b)  $\{10, 14, 18, 22\}$
- (4) Explain why the set of perfect fourth powers is a subset of the set of perfect squares.
- (5) List all of the subsets of  $\{\emptyset, \{\emptyset\}\}$ .
- (6) Define the *complement*  $\bar{A}$  of a set  $A$  to consist of all those elements *not* contained in  $A$ .

For each of following potential identities, determine whether the identity is always true, sometimes true and sometimes false, or always false. Explain your answers (you may use Venn diagrams).

- (a)  $\bar{\bar{A}} = A$ .
- (b)  $\bar{A} \cap B = A \cap \bar{B}$
- (c)  $\overline{A \cup B} = \bar{A} \cup \bar{B}$
- (d)  $\overline{A \cap B} = \bar{A} \cup \bar{B}$