**MATH 102: IDEAS OF MATH**

WORKSHEET 13

## Proof by contradiction

*Problem* 1. Show that if $A$ and $B$ are sets, then

$$A \cap (B \backslash A) = \emptyset \,.$$

*Problem* 2. Read 7.5 and discuss.

We conclude the logic part by the following proofs, which will employ proof by contradiction.

**Theorem 1.** *There are infinitely many primes.*

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**Theorem 2.** $\sqrt{2}$ *is irrational.*

**Theorem 3.** *Let* $a$ *and* $m$ *be natural numbers. There exist unique natural numbers* $q$ *and* $r$ *such that* $0 \leqslant r < m$ *and*

$$a = mq + r\,.$$