

## Math 301: Introduction to Proofs

Problem Set 2

due: February 11, 2019

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**Read.** §1.5, §2.1, §2.2

**Exercise 1.** Define  $P \leftrightarrow Q$  (which we read as “ $P$  if and only if  $Q$ ”) to mean  $(P \rightarrow Q) \wedge (Q \rightarrow P)$ . This exercise presents several equivalent forms of this definition.

- (a) Prove that  $P \leftrightarrow Q$  is logically equivalent to  $(P \rightarrow Q) \wedge (\neg P \rightarrow \neg Q)$  by
  - (i) arguing symbolically, from logical equivalences discussed in class and
  - (ii) using a truth table.
- (b) Prove that  $P \leftrightarrow Q$  is locally equivalent to  $(P \wedge Q) \vee (\neg P \wedge \neg Q)$  by
  - (i) arguing symbolically, from logical equivalences discussed in class and
  - (ii) using a truth table.

**Exercises.**

§1.5 | 3, 10

**Exercises.**

§2.1 | 3, 7, 8, 9

**Exercises.**

§2.2 | 3, 9

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