

Homework #4, Due: 2/7
Math 181 (Discrete Structures), Spring 2024

Problem 1 is worth 5 points (1.25 pts each part), and Problem 2 is worth 5 points (1.25 pts each part), for a total of 10 points. Remember to *show your work* and *explain your answers* on all problems!

1. Let $P(x)$ denote the statement “ x is a professional athlete” and $Q(x)$ the statement “ x plays soccer.” The domain of discourse is the set of all people.

For each of the following: write the proposition in English, and determine (based on your common sense understanding of the world) if it is true or false.

- (a) $\forall x Q(x) \rightarrow P(x)$
- (b) $\forall x P(x) \vee Q(x)$
- (c) $\exists x \neg P(x) \wedge Q(x)$
- (d) $\exists x P(x) \wedge \neg Q(x)$

2. Let $P(x)$ denote the statement “ x lives in Maryland” and $Q(x)$ the statement “ x lives in the United States.” The domain of discourse is the set of all people.

For each of the following: write the proposition in logical symbols, and determine (based on your common sense understanding of the world) if it is true or false.

- (a) Everyone who lives in Maryland lives in the United States.
- (b) Everyone who lives in the United States lives in Maryland.
- (c) There is someone who lives in Maryland but does not live in the United States.
- (d) There is someone who does not live in Maryland but does live in the United States.