

# Math 338 - Homework 1

Due Friday 1/14

*Answer the following questions. You are encouraged to work with other students and to seek help from the instructor while working on these problems, but please write up your answers on your own.*

1. (Boyce 1.1) Create truth tables for ‘ $X$  and  $Y$ ’ and ‘ $X$  or  $Y$ ’
2. (Boyce 1.2) Consider the following statement, for which  $n$  represents an arbitrary positive integer.

If  $n < 2$  then  $n < 5$ .

- (a) Is the conditional statement true (for any value of  $n$ )?
  - (b) State the negation, converse, contrapositive, and inverse of the statement. Which are true? Which are false? Why?
3. (Boyce 1.4) We defined “collinear” as follows: three points in a plane are **collinear** if one point lies on the line that connects the other two points.
    - (a) Create a definition for **non-collinear** points in a place.
    - (b) According to your definition, can two points ever be non-collinear? Explain.
  4. (Barsamian 1) Look at the following axiom system. Which of the following interpretations is a model of Axiom System 1? Explain. (Hint: Two of the following are models and one is not.)

Axiom System:	Axiom System #1
Primitive Relations:	relation on the set of integers spoken “ $x$ is related to $y$ ”
Axioms:	$\langle 1 \rangle$ 5 is related to 7 $\langle 2 \rangle$ 5 is related to 8 $\langle 3 \rangle$ For all integers $x$ and $y$ , if $x$ is related to $y$ , then $y$ is related to $x$ . $\langle 4 \rangle$ For all integers $x$ , $y$ , and $z$ , if $x$ is related to $y$ and $y$ is related to $z$ , then $x$ is related to $z$ .

- (a) Interpret the words ‘ $x$  is related to  $y$ ’ to mean ‘ $xy > 0$ ’.
- (b) Interpret the words ‘ $x$  is related to  $y$ ’ to mean ‘ $xy \neq 0$ ’.
- (c) Interpret the words ‘ $x$  is related to  $y$ ’ to mean ‘ $x$  and  $y$  are both even or both odd’.