

MAT 1348 B— Assignment 2 — Due Feb. 8 at 11:20am

1. Using **truth trees**, determine whether or not the proposition

$$((p \rightarrow q) \rightarrow (r \rightarrow q)) \rightarrow (p \rightarrow r)$$

is a tautology. If you claim that it is not, give a counterexample.

2. Using **rules of inference**, prove the validity of the argument below. *Name the rule of inference or equivalence used at each step.*

$$x \rightarrow (y \vee z)$$

$$y \rightarrow w$$

$$\neg z$$

$$\therefore x \rightarrow w$$

3. (a) Transcribe the argument below into compound propositions:

“You will meet Mark only if you are in the algorithms class. If you are not in the algorithms class and you are not in the data structures class, you will not meet Barb. You meet Barb or you do not meet Mark. Therefore, if you are in the data structures class, you meet Barb.”

Use the following atomic propositions:

a : “You are in the algorithms class.”

m : “You meet Mark.”

d : “You are in the data structures class.”

b : “You meet Barb.”

- (b) Determine whether or not the argument above is valid using

- i. truth tables;
- ii. truth trees.

If you claim the argument is not valid, give a counterexample.

4. Use a **direct proof** to show the following:

If a and b are two rational numbers, then $a^2b + 3$ is a rational number.

5. Use a **proof by contradiction** to show the following:

If n is a perfect square, then $n - 2$ is not a perfect square.

(Definition: An integer n is said to be a *perfect square* if $n = m^2$ for some integer m .)