

MATH310 Homework 2022-07-11
Due Gradescope 11:59pm 2022-07-13

1. For each of the following, determine first if the item is a proposition or not. If it is a proposition [10 pts] determine if it is true or false. If it is not a proposition leave the last column blank.

Item	Proposition Y/N	T/F
$\sqrt{401} > 20$.		
All nonnegative real numbers are positive.		
All positive real numbers are nonnegative.		
$\pi^\pi < e^e$		
She is happy.		

2. Make up a truth table for the propositional form: [15 pts]

$$(P \vee Q) \wedge \sim R$$

Include columns for P , Q , R , $P \vee Q$, $\sim R$, and the final result.

3. Write down a useful negation of each of the following.

(a) The real number x is greater than or equal to 100. [5 pts]

(b) I bought eggplant and spinach for dinner. [5 pts]

(c) The real number x is positive or the integer y is not prime. [5 pts]

(d) The integral is unbounded or the function is continuous and not differentiable. [5 pts]

4. Define the propositions: [20 pts]

- P : I like cars.
- Q : I like motorcycles.
- R : I don't like rice pudding.

Write down a sensible English statement corresponding to the proposition:

$$\sim P \wedge (Q \vee R)$$

5. Use a truth table to verify that the following is a tautology: [15 pts]

$$\sim P \vee (P \vee Q)$$

6. Use a truth table to verify the following DeMorgan's Law: [20 pts]

$$\sim(P \vee Q) \equiv \sim P \wedge \sim Q$$