

Term: 2022

Name: \_\_\_\_\_

Instructor: Patricia Wrean

**MATH 156**  
**Practice Test 2B**

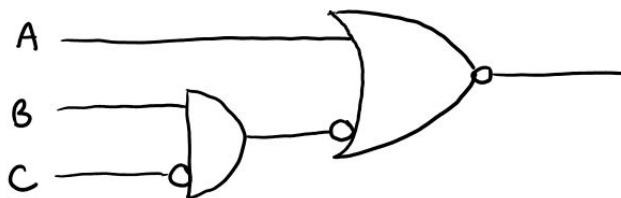
**Total =  $\overline{30}$**

- All of the work on this test must be your own.
- You may use a scientific calculator. You may not use a calculator with graphing capability or a smartphone app.

**GOOD LUCK!**

1. (5 points) Simplify the logical expression  $(\sim q \oplus 1) \vee (q \wedge p)$ . Use a truth table to justify your answer.

2. (3 points) Write the Boolean expression that corresponds to the following gate diagram. Do not simplify!



3. (4 points) The following statement is true: “If the roads are icy, then driving is unsafe”. Given that, answer the following by selecting the correct choice.

- |   |                  |
|---|------------------|
| (a) The roads are not icy. Is driving unsafe? | Yes / No / Maybe |
| (b) Driving is unsafe. Are the roads icy?     | Yes / No / Maybe |
| (c) Driving is safe. Are the roads icy?       | Yes / No / Maybe |
| (d) The roads are icy. Is driving safe?       | Yes / No / Maybe |

4. (4 points) Consider the following statements.

- (a) The door is locked or unlocked.
- (b) The door is locked and unlocked.
- (c) The door is locked or not unlocked.
- (d) The door is locked and not unlocked.

Which of the above statements is always false? \_\_\_\_\_

Which of the above statements is the negation of “The door is unlocked”? \_\_\_\_\_

5. (3 points) Let  $p =$  “Everything is awesome”,  $q =$  “You are part of a team”, and  $r =$  “You are living the dream”. Rewrite the following English sentences into logical symbols. Do not simplify!
- (a) If you are part of a team, then everything is awesome. \_\_\_\_\_
- (b) If everything is awesome, then you are living the dream and vice versa. \_\_\_\_\_
- (c) You are not part of a team or you are living the dream. \_\_\_\_\_
6. (4 points) Is the expression  $(p \wedge \sim q) \rightarrow 0$  logically equivalent to  $\sim q \rightarrow \sim p$ ? Use a truth table to justify your answer.

For the questions on this page: if you are using the Laws of Logic, remember to use one law of logic per line, and be sure to state the name of the law you are using!

7. (5 points) Prove the following using the laws of logic. If you're stuck, try using a truth table for part marks.

$$A + \overline{B}(B + \overline{B}) = \overline{A} \overline{B} + \overline{\overline{A} B}$$

8. (2 points) Simplify the following. This is the nasty question I promised you and credit will only be awarded if the laws of logic are used to simplify the expression.

$$\overline{\overline{A} \overline{B} \overline{B} A} + \overline{\overline{A} B \overline{B} A}$$