Midterm

Math 105

Summer 2020

You have 110 minutes to complete this exam **(this includes the time it takes to scan and upload it)**. You may not use a calculator, your notes, the textbook, or any other resources. Write your solutions on a separate sheet of paper, and when you're finished, first check your work if there is time remaining, then scan it and upload it to Canvas. If you have a question, don't hesitate to ask — I just may not be able to answer it.

1. (8 points) Construct a truth table for the expression $p \longrightarrow (q \wedge r)$.

2. (8 points) Consider the following argument:

1. All tigers have stripes.
2. Nothing with stripes is a bear.
3. All brown animals are bears.

Conclusion: No tigers are brown.

Is this argument valid or invalid? Draw a Venn diagram proving your answer.

3. (8 points) Convert the argument in problem 1 to symbolic form. Clearly define all variables you use.

4. (8 points) Consider the following argument:

1. You eat only if you are hungry.
2. If you go to a restaurant, then you eat.

Conclusion: You are hungry if you go to a restaurant.

This argument is valid — prove it with the techniques of section 1.5 (i.e. not with elementary valid arguments).

5. (8 points) State (in words) the converse, inverse, and contrapositive of the statement "You are hungry if you go to a restaurant". Indicate which is which. Of the three, which one is equivalent to the original statement?

6. (8 points) Let A be the set of UO students who are currently taking Math 105 and B the set who have previously taken and passed 105. Let the universe U be the entire set of UO students. Describe (in words) the sets $A \cup B$, $A \cap B$, A', and B'.

7. (8 points) With A, B, and U as in problem 6, which of the following is/are true, if any? Explain your answer.

i. $A \cup B = \varnothing$.
ii. $A \cap B = \varnothing$.
iii. $A' = \varnothing$.
iv. $B' = \varnothing$.

8. (8 points) Let C and D be sets such that C contains 15 elements, D contains 10, and $C \cup D$ contains 17. What must $n(C \cap D)$ be?