Math 212 **Exam 1** **Mar. 5, 2021**

Name: _____

Instructions: This exam has 5 questions for a total of 51 points. Answer each question as completely and clearly as you can. Make sure to use complete sentences. Take care to not oversimplify any problems. You have 50 minutes.

Question	Points	Score
1	10	
2	15	
3	8	
4	10	
5	8	
Total:	51	

(10 points) 1. Suppose you have 42 identical toy pink ducks and 7 identical toy purple ducks. How many ways are there to arrange them in a line so that no two purple ducks are next to one another?

(15 points) 2. One college sent another a report saying that 119 students took Calculus I in a Fall semester. The report notes that during the next term, 96 of these studnets took Calculus II, 53 took Discrete Mathematics, and 39 took Physics II. The report says that 48 of the students took Calculus II and Discrete Mathematics, 31 of the students took both Discrete Mathematics and Physics II, 32 of the students took both Calculus II and Physics II, and 22 of the students took all three courses. We examine the report and sense an error is present. Why?

(8 points) 3. Let $f : \{1, 2, 3, 4, 5\} \to \{a, b, c, d\}$ be a function. Justify your answers to the following questions.

(a) How many such functions f exist?

(b) How many such functions are injective?

(c) How many such functions are surjective?

(d) How many such functions are bijective?

(10 points) 4. Let $S = \{a, b, c, d\}$, $T = \{1, 2, 3\}$, and $U = \{b, 2\}$. Which of the following statements is true? Which is false? Explain.

(a) $\{a\} \in S$

(b) $\{a, c, 2, 3\} \subseteq S \cup T$

(c) $U \in \mathcal{P}(S \cup T)$

(d) $\emptyset \subseteq \mathcal{P}(S)$

(e) $\{\emptyset\} \subseteq \mathcal{P}(S)$

(8 points) 5. Consider the relation $<$ (less than) on the set of integers $\mathbb{Z}$. Is $<$ an equivalence relation? Justify your answer.