Name:

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8.

True/False [1 pt each] For each of the following statements, decide whether it is true or false. Put **T** or **F** on the answer sheet.

1. Let $A = \{\text{red square, red octagon, blue triangle, yellow hexagon, blue hexagon}\}$. Let $P(x, y)$ be the propositional function "*x has the same number of sides as y*" and let $Q(x, y)$ be the propositional function "*x and y have the same color.*"

$$\forall x \in A \; \exists y \in A \; (\sim P(x, y) \wedge Q(x, y)) \vee (P(x, y) \wedge \sim Q(x, y))$$

2. For any propositions P, Q, and R, the compound propositions $P \Rightarrow (Q \Rightarrow R)$ and $(P \Rightarrow Q) \Rightarrow R$ are logically equivalent. (*Hint:* make a truth table.)

3. There are $(7)(6)(5)(4) = 840$ different injective function $f : \{1, 2, 3, 4\} \to \{A, B, C, D, E, F, G\}$.

4. If A, B, C are sets, then $A - (B - C) = (A - B) - C$. (*Hint:* draw a Venn diagram or try an example.)

5. If $f : X \to Y$ is a function and $A \subseteq X$ then $f^{-1}(f(A)) = A$.

6. If $f : X \to Y$ is an injective function and $A \subseteq X$ then $f^{-1}(f(A)) = A$.

7. $2 + 4 + 8 + 16 + \cdots + 2^n = 2^{n+1} - 2$ for every $n \in \mathbb{N}$.

Short answer [3 points]

8. Choose one of the true/false problems above and explain why it is true or false. Write your answer clearly and carefully. Neatness counts.