

COMP 1805 Discrete Structures I

Study Session Questions

December 26, 2025

Confidence Check

1. I am confident in my ability to understand propositional logic expressions and argue with quantified predicates.
2. I am confident in my ability to use set identity rules and apply concepts of graph theory.
3. I am confident in my ability to understand Big-O notation, combinatorics, functions, relations, and summations.
4. I am confident in my ability to write direct proofs and proofs by induction, contradiction, and counterexample.

Proofs

5. PROVE or DISPROVE: If x and y are rational numbers, then $x \cdot y$ is a rational number.

6. Prove or disprove the converse of the statement: For all integers $n > 1$, n can be written as a

product of primes.

Predicate Calculus

7. Given $\alpha = \text{True}$, $\beta = \text{False}$, and $\delta = \text{False}$, which statements are true? Select all that apply.

- ☐ $((\alpha \vee \beta) \wedge \neg \delta)$
☐ $((\alpha \wedge \beta) \vee (\neg \delta \wedge \alpha))$
☐ $((\beta \Rightarrow \alpha) \wedge (\delta \vee \alpha))$
☐ $((\alpha \wedge \delta) \vee (\beta \wedge \neg \delta))$
☐ none of these

8. Consider the statement: *If it rains, then the ground is wet.* Which of the following conclusions are valid?

- ☐ If the ground is wet, it has rained.
☐ If the ground is not wet, then it has not rained.
☐ If it does not rain, the ground will never be wet.
☐ It is not possible that the ground is dry and it is raining.
☐ none of these

- | | | |
|---|---|-------------------------|
| | 1. $\neg((\beta \rightarrow \alpha)) \wedge (\beta \wedge \alpha)$ | A. Contradiction |
| 9. Match each logical expression to its type. | 2. $(\alpha \rightarrow \neg \beta) \vee \neg(\alpha \vee \beta)$ | B. Tautology |
| | 3. $\neg((\neg \beta \wedge \neg \alpha) \wedge \neg(\alpha \rightarrow \beta))$ | C. Contingency |

Sets & Graph Theory

- | | | |
|---|---|----------------------------------|
| | 1. $A \cup (A \cap B) = A$ | A. Absorption Identity |
| | 2. $A \cup A = A$ | B. Idempotence Law |
| 10. Match each set identity to its example. | 3. $(A \cup B)^c = A^c \cap B^c$ | C. DeMorgan's Law |
| | 4. $A - B = A \cap B^c$ | D. Difference Equivalence |
11. A tree of n vertices has exactly $n - 1$ edges.

- ☐ True
- ☐ False

Big-O and Functions

12. PROVE or DISPROVE: For all integers a and b , if $a \mid b$ then $a \leq b$.

13. Consider $f(n) = 7n^2 - 24n + 3$. Which of the following are true? Select all that apply.

- ☐ $f(n) \in O(n^2)$
- ☐ $f(n) \in \Theta(n^2)$
- ☐ $f(n) \in \Omega(n^2)$
- ☐ $f(n) \in O(n)$