NAME YOU ASKED TO BE CALLED IN CLASS:

SCORE: _____ / 35 POINTS

+6   GREENSHEET
     QUIZ SCORE

1. **NO CALCULATORS OR NOTES ALLOWED**
2. **UNLESS STATED OTHERWISE, YOU MUST SIMPLIFY ALL ANSWERS**
3. **SHOW PROPER CALCULUS LEVEL WORK TO JUSTIFY YOUR ANSWERS**

Consider the following statements.   SCORE: __2__ / 2 PTS

(i) $\{x\} \subseteq \{x, y, \{z\}\}$ (ii) $\{z\} \in \{x, y, \{z\}\}$ (iii) $\{z\} \subseteq \{x, y, \{z\}\}$

Which of the statements above are true ? **Circle the correct answer below.**

[a]   none are true   [b]   only (i) is true   [c]   only (ii) is true   [d]   only (iii) is true

[e]   only (i) and (ii) are true   [f]   only (i) and (iii) are true   [g]   only (ii) and (iii) are true   [h]   all are true

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Rewrite the following statement using 2 variables and the formal structure mentioned in the 1.1 lecture notes.   SCORE: ⃝ / 2 PTS
NOTE: Do NOT use any symbols, except for the variables.

"There's an instructor for each class."

There's an instructor x for each class y.

If $N = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$ and $L = \{a, b, c, d, e, f, g, h, i, j, k\}$,   SCORE: __2__ / 2 PTS
how many elements are in the Cartesian product of L and N ?

$11 \times 9 = 99$ elements

Fill in the blanks for the following **formal definitions**. Use proper mathematical notation.   SCORE: _____ / 4 PTS

[a]   Given sets M and N, N is a subset of M (or $N \subseteq M$) if and only if _every element in N is in N._

[b]   The Cartesian product of sets M and N is $M \times N =$ _set of ordered pairs (x, y) where x is in M and y is in N_

Determine if $p \oplus q \equiv \sim p \leftrightarrow q$. **State your final answer clearly.**   SCORE: ⃝ / 3 PTS

Write the **formal definition** of a relation used in discrete math. Use correct English and mathematical notation. **SCORE:** ◯ / 2 PTS

Given two sets A, B. Their subset is in $A \times B$. ARB IFF
- $R \in A \times B$
- If $x \in A$, $y, z \in B$ and xRy, xRz then $y = z$.

Classify each statement as Universal Existential (**UE**), Existential Universal (**EU**) or Universal Conditional (**UC**).   **SCORE:** 1 / 2 POINTS

[a]   All calculus students have passed the same placement test.   UE

[b]   Students who have parking stickers can park in lot C.   UC ①

Consider the statement "if $\frac{1}{x} < 1$, then $x > 1$". (Assume x is a particular real number.)   **SCORE:** ___ / 4 POINTS

[a]   Write a logically equivalent statement using "is necessary for". **Do NOT use statement variables in your final answer.**

$x > 1$ is necessary for $\frac{1}{x} < 1$. ①

[b]   Write a logically equivalent statement using "unless". **Do NOT use statement variables in your final answer.**

Unless $\frac{1}{x} < 1$, then $x \leq 1$. ✱

[c]   Write the contrapositive of the statement. **Do NOT use statement variables in your final answer.**

If $x \leq 1$, then $\frac{1}{x} \not> 1$. ①

[d]   Write the negation of the statement. **Do NOT use statement variables in your final answer.**

$\frac{1}{x} < 1$ and $x \leq 1$. ①

Determine if the following argument is valid. **State your final answer clearly.**   **SCORE:** 6½ / 8 PTS
NOTES: This is NOT an essay question. Use the method shown in lecture and section 2.3. Do NOT use the Rules of Inference.

If I save a lot of money, then I can quit my second job or I can buy a new car.
I did not save a lot of money and I cannot quit my second job.
Therefore, I cannot buy a new car.

$$p \to (q \vee r)$$
$$\sim p \wedge \sim q$$
$$\therefore \sim r \quad ②$$

p	q	r	$\sim p$	$\sim q$	$q \vee r$	$p \to (q \vee r)$	$\sim p \wedge \sim q$	$\sim r$
T	T	T	F	F	T	T	F	F
F	T	T	T	F	T	T	F	F
T	F	T	F	T	T	T	F	F
F	F	T	T	T	T	T	T	F
T	T	F	F	F	T	T	F	T
F	T	F	T	F	T	T	F	T
T	F	F	F	T	F	T	F	T
F	F	F	T	T	F	T	T	T

The argument is invalid ①