NAME YOU ASKED TO BE CALLED IN CLASS:

SCORE: 26½ /35 POINTS $20\frac{1}{2} + 6$ GREENSHEET QUIZ SCORE

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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

② [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: 0 / 2 PTS
NOTE: Do NOT use any symbols, except for the variables.

"There's an instructor for each class."

There is an instructor x for a 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 ?

$9 \cdot 11 =$ 99 elements
① ①

Fill in the blanks for the following **formal definitions**. Use proper mathematical notation.   SCORE: 2 / 4 PTS

[a] Given sets M and N, N is a subset of M (or $N \subseteq M$) if and only if ②for all $x \in N$, $x \in M$. $x \in$

[b] The Cartesian product of sets M and N is $M \times N =$ the set of all ordered pairs $(m, n) \in M \times N$

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

p	q	$p \oplus q$	$\sim p$	$\sim p \leftrightarrow q$
T	T	F	F	F
T	F	T	F	T
F	T	T	T	T
F	F	F	T	F

½   ①

Because $p \oplus q$ and $\sim p \leftrightarrow q$ have the same truth valves, they are logically equivalent.

½

Write the **formal definition** of a relation used in discrete math. Use correct English and mathematical notation.   SCORE: ½ /2 PTS

Given sets A and B, a relation R is a subset. *FROM/TO? OF WHAT?*

xRy IFF x is related to y by R and (x,y) ∈ R.

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. U E

[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.) $p \to q$ SCORE: 3 /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.**

$\frac{1}{x} < 1$ unless $x \le 1$

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

If $x \le 1$, then $\frac{1}{x} \ge 1$, ①

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

$\frac{1}{x} < 1$ and $x \le 1$. ①

Determine if the following argument is valid. **State your final answer clearly.**   SCORE: 7 /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.   *p / q / v / r*
~p   I did not save a lot of money and I cannot quit my second job.   *~ ^ ~q*
Therefore, I cannot buy a new car.
~r

$p \to (q \lor r)$
$\sim p \land \sim q$
$\therefore \sim r$
②

p	q	r	(q∨r)	p→(q∨r)	~p	~q	~p∧~q	~r
T	T	T	T	T	F	F	F	F
T	T	F	T	T	F	F	F	T
T	F	T	T	T	F	T	F	F
T	F	F	F	F	F	T	F	T
F	T	T	T	T	T	F	F	F
F	T	F	T	T	T	F	F	T
F	F	T	T	T	T	T	T	F
F	F	F	F	T	T	T	T	T

← Premise   Premise   conclusion
②   ②

This argument is invalid ①
because there is a critical
row where the premises are all
true, but the conclusion is false.