Lesson Review

Learning Objectives

Please list the learning objectives of this module that you have achieved:
I certified that I am able to:

- Apply common set operations.
- Express sets using enumeration or set builder notation, and go back and forth between the two representations.
- Identify common properties of functions.

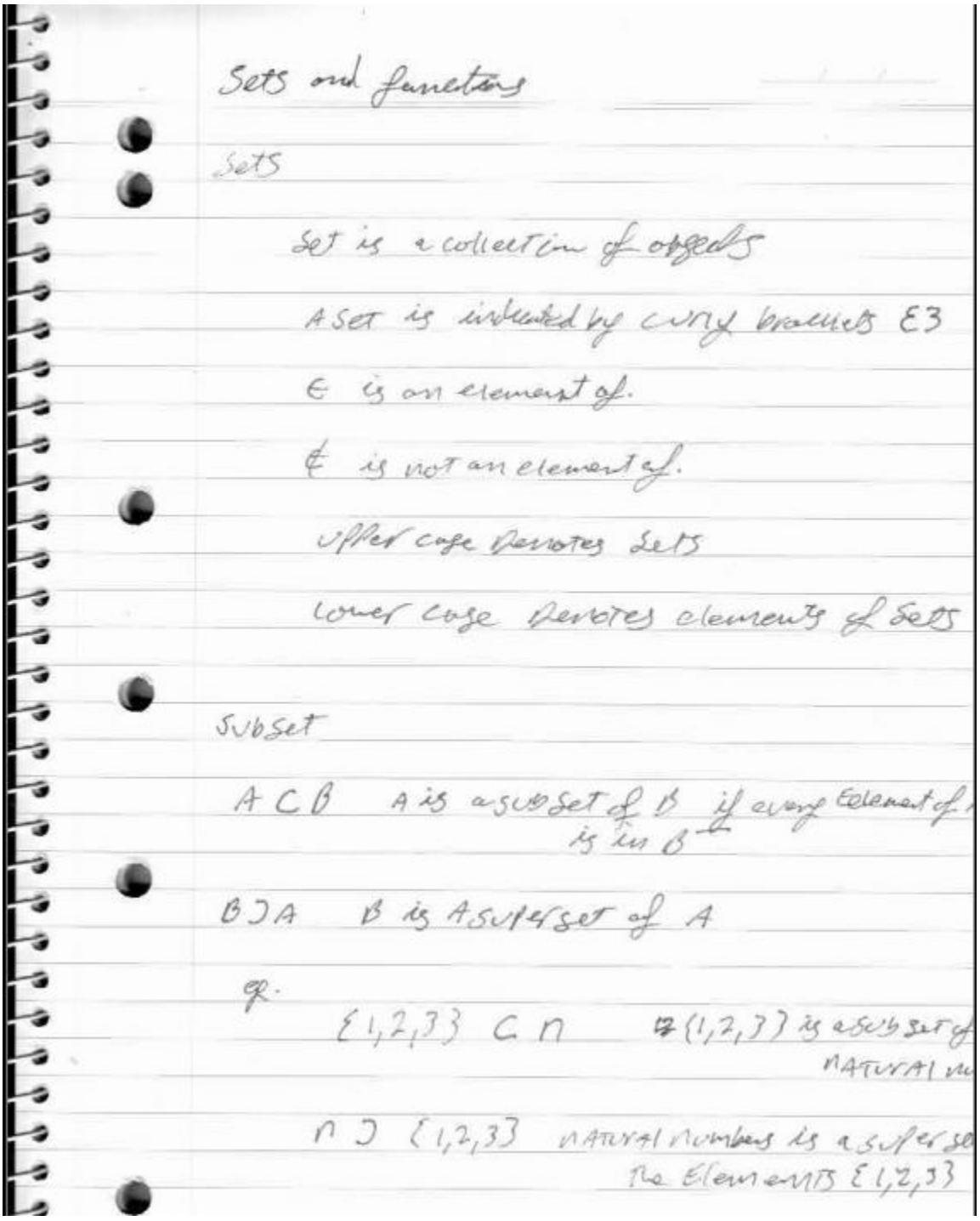
Learning Review

Please complete the table below (refer to the attached Learning Process table).

Learning Objective	**Concept** What concept / key-word did you focus on?	**Step**	**Strategy** What strategy did you apply? Why did you choose this? How did you apply it? Did it work well? How do you know?	**Resource** What resource did you use? Why did you choose this? Did it work well?	**Reflection** In hindsight, was this strategy and resource • appropriate? Why? • identify other options • was this the best option? Why?	**Learning** Generalise: what you learned that could be applied in the future in a different context
Set Operations	Apply common set operations	Identify	Identify Concepts and make a list of resources needed	Unit Site Content		
		Making Sense	Read Text and Site Content, watch lecture videos, watch and follow external videos	Prescribed Text Book		
				Recorded Lectures		
		Making Meaning	Attempt practical questions, verify answers against online tools to identify any mistakes and try again	External Videos		

enumeration or set builder notation	Express sets using enumeration or set builder notation, and go back and forth between the two representations	Identify	Identify Concepts and make a list of resources needed	Unit Site content Prescribed Text Book Recorded Lectures External Videos		
		Making Sense	Read Text and Site Content, watch lecture videos, watch and follow external videos			
		Making Meaning	Attempt practical questions, verify answers against online tools to identify any mistakes and try again			
properties of functions	Identify common properties of functions	Identify	Identify Concepts and make a list of resources needed	Unit Site content Prescribed Text Book Recorded Lectures External Videos		
		Making Sense	Read Text and Site Content, watch lecture videos, watch and follow external videos			
		Making Meaning	Attempt practical questions, verify answers against online tools to identify any mistakes and try again			

Learning Evidence



Sets and functions

Sets

Set is a collection of objects

A set is indicated by curly brackets {}

$\in$ is an element of.

$\notin$ is not an element of.

Upper case denotes sets

Lower case denotes elements of sets

Subset

$A \subset B$ A is a subset of B if every element of A is in B

$B \supset A$ B is A superset of A

eg.

$\{1,2,3\} \subset \mathbb{N}$ {1,2,3} is a sub set of NATURAL nu

$\mathbb{N} \supset \{1,2,3\}$ NATURAL Numbers is a super se The Elements {1,2,3}

Set operation definition

$\cup$ = union

The union of A and B is the set of elem
in A or B (or both) denoted by $A \cup B$

$$A \cup B = \{x : x \in A \text{ OR } x \in B\}$$

$\cap$ = intersection

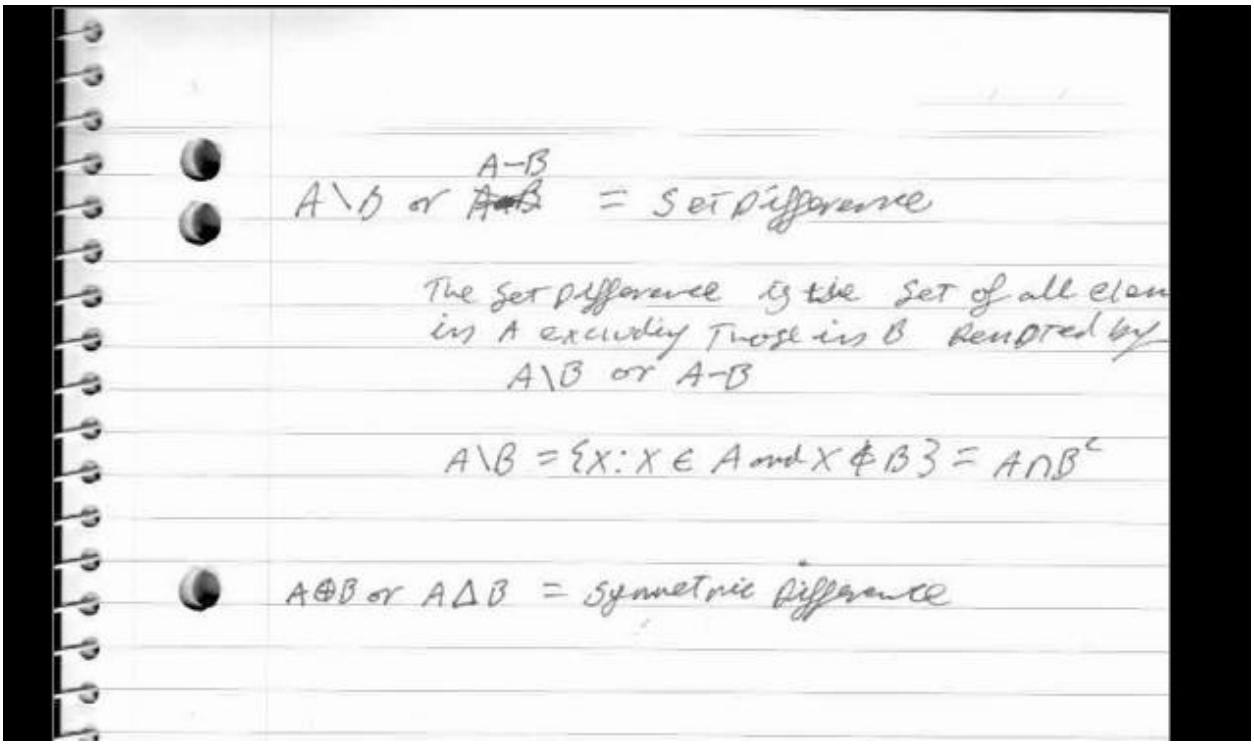
The intersection of A and B is the set of
elements in both A and B denoted by $A \cap B$

$$A \cap B = \{x : x \in A \text{ and } x \in B\}$$

$\bar{A}$ or A' or A^c = complement.

The complement of A is the set of all elements
a universal set U but not in A denoted by
$\bar{A}$ or A' or A^c

$$\bar{A} = \{x : x \in U \text{ and } x \notin A\}$$


A−B
A\B or ~~A−B~~ = Set Difference
The Set Difference is the Set of all elem
in A excluding Those in B Denoted by
A\B or A−B
A\B = {x: x ∈ A and x ∉ B} = A∩B^c
A⊕B or AΔB = Symmetric Difference

Set operations example 1

Suppose. (Universal set)

$U = \{x \in \mathbb{N} : 1 \leq x \leq 9\}$ $\forall$ = for all, $\in$ = exists, $\mathbb{N}$ = natural numbers

$A = \{1,2,3\}$ (Set A)

$B = \{2,3,4,5\}$ (Set B)

$A \cup B = \{1,2,3,4,5\}$

└ The union of A and B — Join

$A \cap B = \{2,3\}$

└ The intersection of A and B — is in BOTH

$\overline{A} = \{4,5,6,7,8,9\}$

└ compliment includes all elements in universal set that are NOT in A

$\overline{B} = \{1,6,7,8,9\}$

└ compliment includes all elements in universal set that are not in B

$A \setminus B = \{1\}$

└ set difference, elements in A that are not in B

$B \setminus A = \{4,5\}$

└ set difference, elements in B that are not in A

$A \oplus B = \{1,4,5\}$

└ Symmetric Difference elements in either set but not in the other

~~Set operations exercise 2:~~

Set operations

$x \in A \cup B$

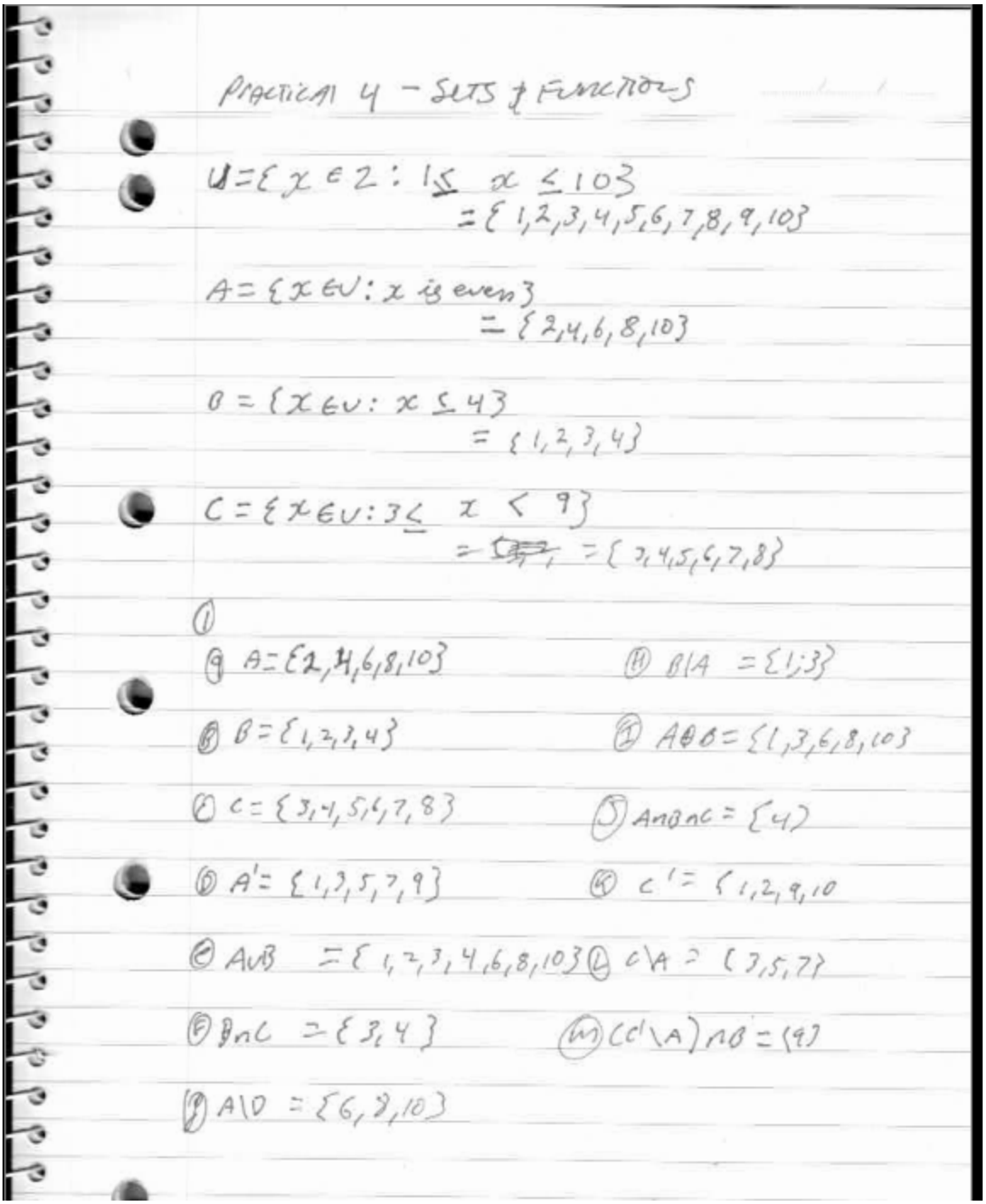
$x \in A \vee x \in B$

$x \in A \cap B$

$x \in A \wedge x \in B$

$x \in A^c$

$\neg (x \in A)$



PRACTICAL 4 - SETS & FUNCTIONS

$U = \{x \in \mathbb{Z} : 1 \leq x \leq 10\}$
$= \{1,2,3,4,5,6,7,8,9,10\}$

$A = \{x \in U : x \text{ is even}\}$
$= \{2,4,6,8,10\}$

$B = \{x \in U : x \leq 4\}$
$= \{1,2,3,4\}$

$C = \{x \in U : 3 \leq x < 9\}$
$= \{3,4,5,6,7,8\}$

(1)

(a) $A = \{2,4,6,8,10\}$

(b) $B = \{1,2,3,4\}$

(c) $C = \{3,4,5,6,7,8\}$

(d) $A' = \{1,3,5,7,9\}$

(e) $A \cup B = \{1,2,3,4,6,8,10\}$

(f) $B \cap C = \{3,4\}$

(g) $A \setminus D = \{6,8,10\}$

(h) $B \setminus A = \{1,3\}$

(i) $A \Delta D = \{1,3,6,8,10\}$

(j) $A \cap B \cap C = \{4\}$

(k) $C' = \{1,2,9,10$

(l) $C \setminus A = \{3,5,7\}$

(m) $(C' \setminus A) \cap B = \{1\}$

(2)

(A) $2 \in A \cap B$ = True

(B) $\{4\} \subseteq A \cap B$ = True

(C) $\{1\} \in A'$

(D) $1 \subseteq \emptyset$

} FALSE incorrect with

(3)

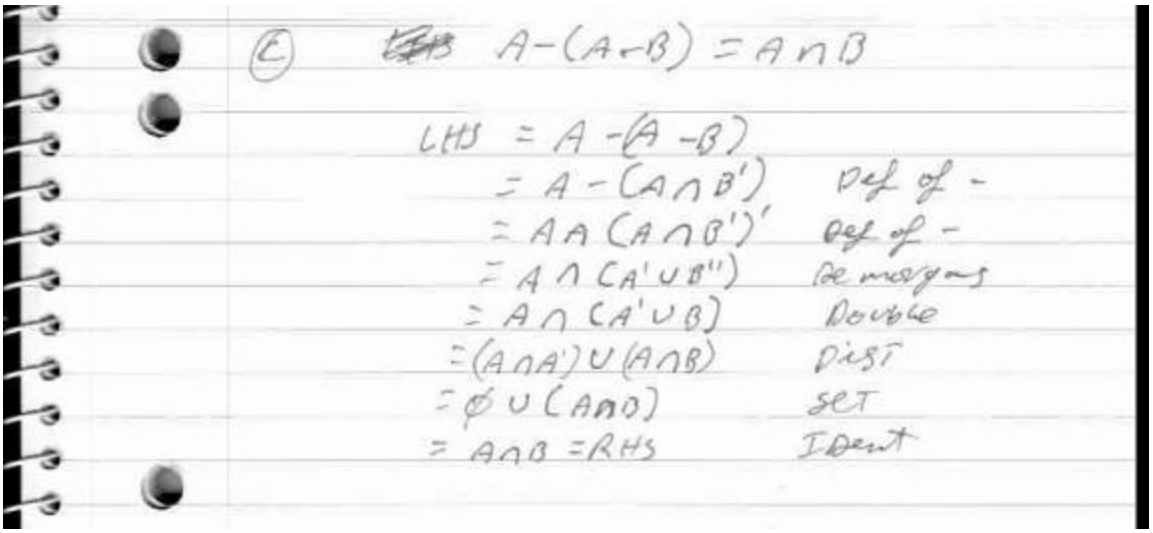
(A) $(A \cap B) \cup (A' \cup B)' = A$

LHS $(A \cap B) \cup (A' \cup B)'$	
$= (A \cap B) \cup (A'' \cap B')$	De morgans
$= (A \cap B) \cup (A \cap B')$	Double.
$= A \cap (B \cup B')$	Dist
$= A \cap U$	Set
$= A = RHS$	Ident

(B) [redacted]

(C) $B' - (B \cap A') = B'$

LHS $= B' - (B \cap A')$	
$= B' \cap (B \cap A')'$	Def of -
$= B' \cap (B' \cup A'')$	De morgans
$= B' \cap (B' \cup A)$	Double
$= B' \cup \emptyset \cap (B' \cup A)$	Ident
$= B' \cup (\emptyset \cap A)$	Dist
$= B' \cup \emptyset$	Domination
$= B = RHS$	Ident



(c) $A-(A-B) = A \cap B$

LHS $= A-(A-B)$	
$= A-(A \cap B')$	Def of -
$= A \cap (A \cap B')'$	Def of -
$= A \cap (A' \cup B'')$	De morgans
$= A \cap (A' \cup B)$	Double
$= (A \cap A') \cup (A \cap B)$	Dist
$= \phi \cup (A \cap B)$	Set
$= A \cap B =$ RHS	Ident

Self-Assessment evidence

Sets and Functions

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score
Sets	
1	3 / 3
Functions	
2	1 / 1
3	1 / 1
4	1 / 1
Total	6 / 6 (100%)

Performance Summary

Exam Name:	Sets and Functions
Session ID:	1569397211
Exam Start:	Wed Apr 29 2020 17:49:30
Exam Stop:	Wed Apr 29 2020 17:57:06
Time Spent:	0:07:36

Question 1

Compute the following set operations, given the sets:

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$A = \{4, 9, 12, 15, 16, 17, 18, 19, 20\}$

$B = \{x \in U : x \text{ is a multiple of } 4\}$

$C = \{x \in U : x > 15\}$