

## HOMework 2

### MATH 2001

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ABSTRACT. This is the second homework assignment. The problems are from Hammack [Ham18, Ch. 1, §1.2]:

- **Chapter 1 Section 2**, Exercises: 2, 4, 8, 12, 18.

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### CHAPTER 1 SECTION 1.2

**Ch.1, §1.2, Exercise 2.** Write out the indicated sets by listing their elements between braces. Suppose  $A = \{\pi, e, 0\}$  and  $B = \{0, 1\}$ .

(a)  $A \times B$

(b)  $B \times A$

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$$(c) A \times A$$

$$(d) B \times B$$

$$(e) \emptyset \times B$$

$$(f) (A \times B) \times B$$

$$(g) A \times (B \times B)$$

$$(h) B^3$$

*Solution to Ch.1, §1.2, Exercise 2.* I worked with the entire class on this solution.

$$(a) A \times B$$

$$= (\pi, 0), (\pi, 1), (e, 0), (e, 1), (0, 0), (0, 1)$$

$$(b) B \times A$$

$$= (0, \pi), (0, e), (0, 0), (1, \pi), (1, e), (1, 0)$$

$$(c) A \times A$$

$$= (\pi, \pi), (\pi, e), (\pi, 0), (e, \pi),$$

$$(e, e), (e, 0), (0, \pi), (0, e), (0, 0)$$

$$(d) B \times B$$

$$= (0, 0), (0, 1), (1, 0), (1, 1)$$

$$(e) A \times \emptyset$$

$$= \emptyset$$

$$(f) (A \times B) \times B$$

$$= ((\pi, 0), 0), ((\pi, 0), 1), ((\pi, 1), 0), ((\pi, 1), 1), ((e, 0), 0), ((e, 0), 1),$$

$$((e, 1), 0), ((e, 1), 1), ((0, 0), 0), ((0, 0), 1), ((0, 1), 0), ((0, 1), 1)$$

$$(g) A \times (B \times B)$$

$$= (\pi, (0, 0)), (e, (0, 0)), (0, (0, 0)), (\pi, (0, 1)), (e, (0, 1)), (0, (0, 1)),$$

$$(\pi, (1, 0)), (e, (1, 0)), (0, (1, 0)), (\pi, (1, 1)), (e, (1, 1)), (0, (1, 1))$$

$$(h) A \times B \times B$$

$$= (\pi, 0, 0), (\pi, 0, 1), (\pi, 1, 0), (\pi, 1, 1), (e, 0, 0), (e, 0, 1),$$

$$(e, 1, 0), (e, 1, 1), (0, 0, 0), (0, 0, 1), (0, 1, 0), (0, 1, 1)$$

□

**Ch.1, §1.2, Exercise 4.** Write the following set by listing its elements between braces:  $\{n \in \mathbb{Z} : 2 < n < 5\} \times \{n \in \mathbb{Z} : |n| = 5\}$ .

*Solution to Ch.1, §1.2, Exercise 4.*

$$A = \{n \in \mathbb{Z} : 2 < n < 5\}$$

$$A = \{3, 4\}$$

$$B = \{n \in \mathbb{Z} : |n| = 5\}$$

$$B = \{5, -5\}$$

$$A \times B = (3, 5), (3, -5), (4, 5), (4, -5)$$

□

**Ch.1, §1.2, Exercise 8.** Write the following set by listing its elements between braces:

$$\{0, 1\}^4$$

*Solution to Ch.1, §1.2, Exercise 8.*

$$\{0, 1\}^4$$

$$\begin{aligned} &= (0, 0, 0, 0), (0, 0, 0, 1), (0, 0, 1, 0), (0, 0, 1, 1), \\ &\quad (0, 1, 0, 0), (0, 1, 0, 1), (0, 1, 1, 0), (0, 1, 1, 1), \\ &\quad (1, 0, 0, 0), (1, 0, 0, 1), (1, 0, 1, 0), (1, 0, 1, 1), \\ &\quad (1, 1, 0, 0), (1, 1, 0, 1), (1, 1, 1, 0), (1, 1, 1, 1) \end{aligned}$$

□

**Ch.1, §1.2, Exercise 12.**

*Solution to Ch.1, §1.2, Exercise 12.*

□

**Ch.1, §1.2, Exercise 18.**

*Solution to Ch.1, §1.2, Exercise 18.*

□

## REFERENCES

[Ham18] Richard Hammack, *Book of Proof*, 3 ed., Creative Commons, 2018.

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