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MATH 3503: Tashfeen's Discrete Mathematics
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Homework 2

Question 1. Please read chapter 2 of Chartrand et al. and write a couple sentences about a topic/example/concept that you found difficult or interesting and why?

I like how the book put the concepts of the different types of number in terms of sets such as $\mathbb{N} \subset \mathbb{Z}$. This made some concepts easier to understand.

Question 2. How many elements are in $\mathcal{P}(A)$ if $A = \{n \in \mathbb{Z} : |n| \leq 5\}$?

11 integers

2^{11} elements

Question 3. Let $A = \{0, \{0\}, \{0, \{0\}\}\}$.

(a) Determine which of the following are elements of $A : 0, \{0\}, \{\{0\}\}$.

0, $\{0\}$

(b) Determine $|A|$

3

(c) Determine which of the following are subsets of $A : 0, \{0\}, \{\{0\}\}$.

$\{0\}$, $\{\{0\}\}$

For (d)-(i), determine the indicated sets.

(d) $\{0\} \cap A$.

$\{0\}$

(e) $\{\{0\}\} \cap A$.

$\{\{0\}\}$

(f) $\{\{\{0\}\}\} \cap A$.

empty

(g) $\{0\} \cup A$.

{0, {0}, {0, {0}}}

(h) $\{\{0\}\} \cup A$.

{0, {0}, {0, {0}}}

(i) $\{\{\{0\}\}\} \cup A$.

{0, {0}, {0, {0}}, {{0}}}

Question 4. For two sets A and B of real numbers, the set $A \cdot B$ is defined by,

$$A \cdot B = \{ab : a \in A, b \in B\}.$$

Determine each of the following sets.

1) $A \cdot B$ for $A = \{\frac{1}{2}, 1, \sqrt{2}\}$ and $B = \{\sqrt{2}, 2, 4\}$.

$\{\frac{\sqrt{2}}{2}, 1, 2, \sqrt{2}, 4, 2\sqrt{2}, 4\sqrt{2}\}$

2) $\mathbb{R} \cdot \mathbb{R}$.

$\mathbb{R}$

3) $\mathbb{R} \cdot C$ where $C \subseteq \mathbb{R}$ with $|C| = 2$.

$\mathbb{R}$

Question 5. For $A = \{1, 2\}, B = \{-1, 0, 1\}$ and the universal set $U = \{-2, -1, 0, 1, 2\}$, determine

(a) $A \cup B$.

{-1, 0, 1, 2}

(b) $A \cap B$.

{1}

(c) $A - B$.

{2}

(d) $\overline{B}$.
{-2, 2}

(e) $A \times B$.
{(1,-1), (1,0), (1,1), (2,-1), (2,0), (2,1)}

Question 6. Give examples of three sets A, B and C such that

(a) $A \subseteq B \not\subset C$.
A = {1}
B = {1, 2}
C = {3}

(b) $A \subseteq B, B \in C$ and $A \cap C = \varnothing$.
A = {1}
B = {1,2}
C = {{1,2}, 3}

(c) $A \in B, A \subset B$ and $A \not\subseteq C$.
A = {1}
B = {{1}, 1, 2}
C = {3}

(d) $A \in B, A \not\subseteq B$ and $B \in C$.
A = {1}
B = {{1}, 2}
C = {{{1},2}, 1}