Homework: Week 1

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Math 100
Due: October 6, 2017
Professor Boltje
MWF 9:20a-10:25a

Section 1.1

12.

Problem:

$$\{x \in \mathbb{Z} : |2x| < 5\}$$

Answer:

$$\{0, \pm 1, \pm 2\}$$

16.

Problem:

$$\{6a + 2b : a, b \in \mathbb{Z}\}$$

Answer:

$$\{...0, \pm 1, \pm 2...\} = \mathbb{Z}$$

22.

Problem:

$$\{3, 6, 11, 18, 27, 38, ...\}$$

Answer:

$$\{x^2 + 2 : x \in \mathbb{N}\}$$

38.

Problem:

$$|\{x \in \mathbb{N} : 5x \leq 20\}|$$

Work:

$$x = \{1, 2, 3, 4\}$$

Answer:

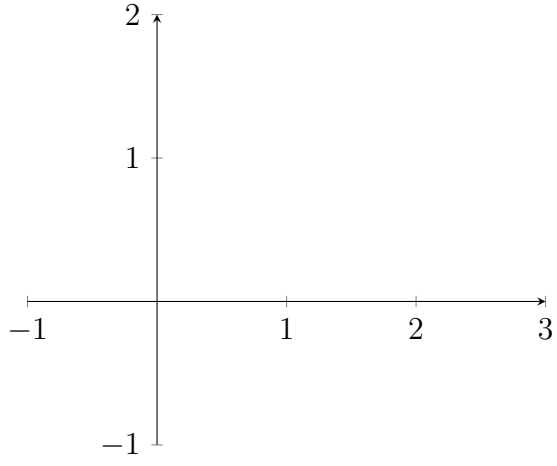
$$Cardinality = 4$$

42.

Problem:

Sketch the following set of points in the x-y plane.

$$|\{(x, y) : x = 2, y \in [0, 1]\}|$$



Answer:

Section 1.2

2(f).

Given:
$A = \{\pi, e, 0\}$ and $B = \{0, 1\}$

Problem:

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

Work:

$\{(\pi, 0), (\pi, 1), (e, 0), (e, 1), (0, 0), (0, 1)\} \times B$

Answer:

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

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

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

$((0, 0), 1), ((0, 1), 1)\}$

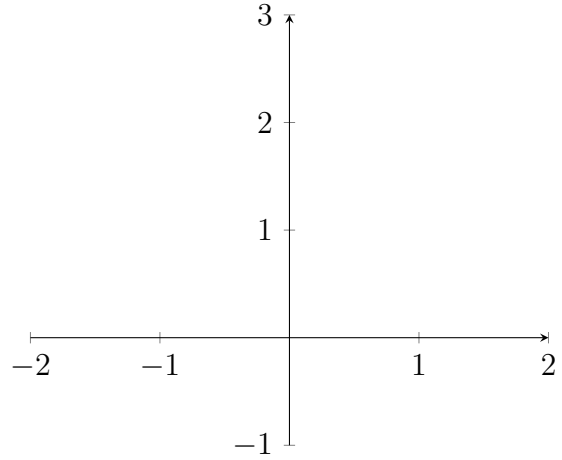
12.

Problem:

Sketch the Cartesian product on the x-y plane.

$$[-1, 1] \times [1, 2]$$

Answer:



Section 1.3

10.

Problem:

$$\{X \subseteq \mathbb{N} : |X| \leq 1\}$$

Answer:

$$\{\emptyset, \{1\}, \{2\}, \{3\}, ...\}$$

14.

Problem:

$$\mathbb{R}^2 \subseteq \mathbb{R}^3$$

Answer: False, because an element in $\mathbb{R}^2$ is not an element in $\mathbb{R}^3$.

Section 1.4

6.

Problem:

$$\mathscr{P}(\{1, 2\}) \times \mathscr{P}(\{3\})$$

Answer:

$\{(\emptyset, \emptyset), (\emptyset, \{1\}), (\emptyset, \{2\}), (\emptyset, \{1, 2\}),$

$(\{3\}, \emptyset), (\{3\}, \{1\}), (\{3\}, \{2\}), (\{3\}, \{1, 2\})\}$

18.

Given: Suppose that $|A| = m$ and $|B| = n$.
Reminder: $\mathscr{P}(A) = 2^{|A|}$
Problem: $|\mathscr{P}(A \times \mathscr{P}(B))|$
Answer:

$$2^{m2^n}$$

Section 1.5

2(e).

Given: $A = \{0, 2, 4, 6, 8\}$ and
$B = \{1, 3, 5, 7\}$
Problem:

$$B - A$$

Answer:

$$B - A = \{1, 3, 5, 7\}$$

4(e).

Given: $A = \{b, c, d\}$ and $B = \{a, b\}$
Problem:

$$(A \times B) \cap B$$

Answer:

$$\emptyset$$