MATH 290 HW 1

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E 1.1

a) $S_1 = \{6, 7, 8, 9, 10\}$ $|S_1| = 5$

b) $S_2 = \{-6, -7, -8, -9, -10, 6, 7, 8, 9, 10\}$ $|S_2| = 10$

c) $S_3 = \{\}$ $|S_3| = 0$

d) $S_4 = \{\sqrt{2}, -\sqrt{2}\}$ $|S_4| = 2$

e) $S_5 = \{-1, -2, -3, -4 \ldots 0, 1, 2, 3\}$ $|S_5| = \infty$

E 1.2

a) $A_1 = \{x \in \mathbb{N} : x \text{ is an odd natural number}\}$

b) $A_2 = \{x \in \mathbb{N} : \sqrt[3]{x} \text{ is a natural number}\}$

c) $A_3 = \{x \in S : x \text{ is } < 1\}$

E 1.3

a) $A = \{5x : x \in \mathbb{Z}\}$

b) $B = \{x \in \mathbb{Z} : x = 5k - 2 \text{ for some } k \in \mathbb{Z}\}$

c) $C = \{x \in \mathbb{N} : x = k^4 \text{ for some } k \in \mathbb{N}\}$

d) $D = \{x \in \mathbb{R} : x = 2^n \text{ for some } n \in \mathbb{Z}\}$

E 1.4

a) $A = \{1\}$ $B = \{\{1\}\}$ $C = \{\{\{1\}\}\}$

b) $A = \{1\}$ $B = \{\{1\}\}$ $C = \{\{1\}\}$

c) $A = \{1\}$ $B = \{1, 2\}$ $C = \{\{1\}, \{1, 2\}\}$

d) $A = \{1, 2\}$ $B = \{2, 3\}$ $C = \{3, 4\}$

e) $A = \{\}$ $B = \{0, 1, 2\}$ $C = \{0, 1, 2\}$

E 1.5 $P(A) = \{\emptyset, \{1\}, \{2\}, \{1, 2\}\}$ $|P(A)| = 4$

$P(P(A)) = \{\emptyset, \{\emptyset\}, \{\{1\}\}, \{\{1, 2\}\}, \{2\}, \{\{1, 2\}\}, \{\{2\}, \{1, 2\}\}, \{1, \{1, 2\}\}, \{\{1\}, \{1, 2\}\}, \{1\}, \{\{1\}, \{2\}\}, \{\emptyset, \{1, 2\}\}, \{\{1\}, \{2\}, \{1, 2\}\}, \{\emptyset, \{2\}\}, \{\emptyset, \{1\}\}, \{\emptyset, \{1, 2\}\}, \{\{1\}, \{2\}\}, \{1, 2\}, \{\emptyset, \{1\}, \{2\}\}\}$

$|P(P(A))| = 16$

E 1.6

a) 7

b) 3-9 inclusive

c) 3-6 inclusive

d) 8, 9

e) 3-6

f) 3-8

g) 3-8

→

E 1.7

A. 

B. 

C. 

d 

e. 

E 1.8

a) An odd number cannot be an even ~~not~~ disjoint, & vice versa

b) Disjoint, $\mathbb{N}$ is a subset of $\mathbb{C}$ since any $x \in \mathbb{N}$ can be written with a complex number with 0i. Ex: 1+0i

c) Disjoint, a number cannot be both prime and composite

d) disjoint, a number is either rational or irrational, not both

E 1.a

$U = \{1, 2, 3, 4, 5, 6\}$

$S = \{1, 2, 3\}$

$T = \{1, 3, 4, 5\}$