MATH301 Homework 2

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1 Section 1.5 Problems:4a,4e,4f,4g,8

Suppose$A = \{b, c, d\}$ and $B = \{a, b\}$ Find :

1.5:4a

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

$$(A \times B) = \{(b, a), (b, b), (c, a), (c, b), (d, a), (d, b)\}$$
$$(B \times B) = \{(a, a), (a, b), (b, a), (b, b))\}$$
$$\therefore$$
$$(A \times B) \cap (B \times B) = \{(b, a), (b, b)\}$$

1.5:4e

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

$$(A \times B) = \{(0, 1), (0, 2), (1, 1), (1, 2)\}$$
$$1, 2 \notin (A \times B) \therefore (A \times B) \cap B = \emptyset$$

1.5:4f

$$\mathcal{P}(A) \cap \mathcal{P}(B)$$

$$\mathcal{P}(A) = \{\emptyset, \{b\}, \{c\}, \{d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{b, c, d\}$$
$$\mathcal{P}(B) = \{\emptyset, \{a\}, \{b\}, \{a, b\}$$
$$\therefore \mathcal{P}(A) \cap \mathcal{P}(B) = \{\emptyset, \{b\}$$

1.5:4g

$$\mathcal{P}(A) - \mathcal{P}(B)$$

$$\mathcal{P}(A) = \{\emptyset, \{b\}, \{c\}, \{d\}, \{b,c\}, \{b,d\}, \{c,d\}, \{b,c,d\}$$
$$\mathcal{P}(B) = \{\emptyset, \{a\}, \{b\}, \{a,b\}$$
$$\therefore \mathcal{P}(A) - \mathcal{P}(B) = \{x | x \in \mathcal{P}(A), x \notin \mathcal{P}(B)\} = \{\{c\}, \{d\}, \{b,c\}, \{b,d\}, \{c,d\}, \{b,c,d\}$$

1.5:8
See attached illustration, figure 1

2 Section 1.7 Problems 6,8,12,14

1.7.6
See attached illustration, figure 2
1.7.8
See attached illustration, figure 3
1.7.12
The expression that describes this set it:

$$(A - B) \cup (B \cap C)$$

1.7.14
The expression that describes this set is :

$$(A \cap B \cap C) \cap \Big((A - C) \cap (A - B)\Big)$$

3 4 dimensional cube illustration

See attached illustration, figure 4

4 Bonus