Name: _Solutions_

Directions: Solve the following problems. Give supporting work/justification where appropriate.

1. [**4 parts, 1 point each**] Let $A = \{1, 2\}$ and $B = \{\varnothing, (1,2)\}$. Find the following sets.

   (a) $A \times B$

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

   (c) B^0

   $\{()\}$

   (b) A^2

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

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

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

2. [**1 point**] Give an example of a set C such that C and C^3 have a common element.

   Let $C = \{1, (1, 1, 1)\}$.   Now both C and C^3 have $(1, 1, 1)$
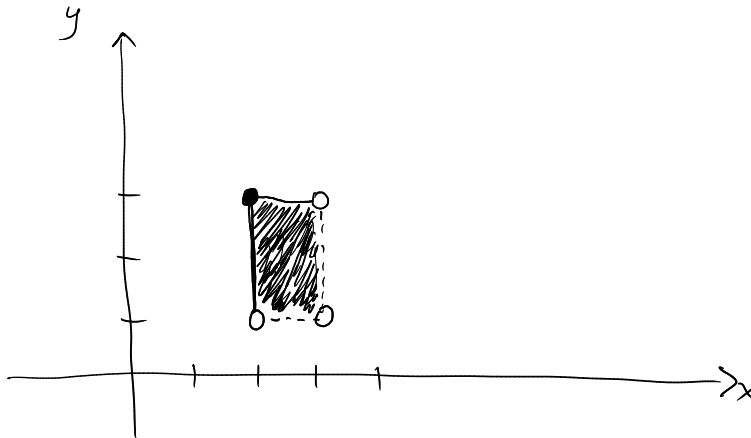
   as a member.

3. [**1 point**] Let $D = \{1, 2, 3, 4\}$. Express $\{X \subseteq D \colon |D| \geq 3\}$ by listing the elements between braces.

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

4. [**1 point**] Draw a picture of $[2,3) \times (1,3]$ in the plane. Use solid lines to indicate boundaries in the set and dashed lines to indicate boundaries outside the set.

$$[2,3) \times (1,3] = \{ (x,y) \in \mathbb{R}^2 : \ 2 \leq x < 3 \ \text{and} \ 1 < y \leq 3 \}$$

5. [**6 parts, 0.5 points each**] True/False. Write the entire word true or false. No justification necessary. We define:

$$A = \{1, 2, \{1, 2\}, \{\varnothing\}\} \qquad B = \{1, \{1, 1\}, \varnothing\} \qquad C = \{\{1\}\} \qquad D = \{\varnothing\}$$

(a) $1 \in A$

$\boxed{\text{TRUE}}$

$A = \{ \textcircled{1} \ 2, \ \{1,2\}, \ \varnothing \}$
$\underset{\uparrow}{} $
$1 \in A$

(b) $C \in A$

$\boxed{\text{FALSE}}$

$\{\{1\}\}$ is not one of the elts in A

(c) $1 \subseteq B$

$\boxed{\text{FALSE}}$ 1 is not a set

(d) $C \subseteq B$

$\boxed{\text{TRUE}}$ C has one element, namely $\{1\}$, and it is a member of B since $\{1,1\} = \{1\}$.

(e) $D \in B$

$\boxed{\text{FALSE}}$. Although $\varnothing \in B$, $\{\varnothing\}$ is not an element in B.

(f) $D \subseteq C$

$\boxed{\text{FALSE}}$, D has an element, namely $\varnothing$, which is not an element of C.