

Directions: You may work to solve these problems in groups, but all written work must be your own. Unless the problem indicates otherwise, all problems require some justification; a correct answer without supporting reasoning is not sufficient. Submissions must be stapled. See “Guidelines and advice” on the course webpage for more information.

1. Let $A = \{1, 2, 3\}$ and $B = \{\sin, \cos\}$. List the elements of the following sets.

- | | | |
|-----------------------------|-----------------------------------|------------------|
| (a) $B \times A$ | (c) $B \times A \times \emptyset$ | (e) moved to HW3 |
| (b) $B \times (A \times B)$ | (d) $A \times \{\emptyset\}$ | (f) moved to HW3 |

2. List the subsets of the following sets.

- | | | |
|--|-----------------|--------------------------|
| (a) $\{\mathbb{R}, \mathbb{N}, \mathbb{Q}\}$ | (b) \emptyset | (c) $\{\{\mathbb{N}\}\}$ |
|--|-----------------|--------------------------|

3. Express the set $\{X \subseteq \mathbb{N} : |X| \leq 1\}$ by listing its elements between braces, using ellipses if necessary.

4. Decide whether the following statements are true or false. Give explanations.

- (a) $\mathbb{R}^2 \subseteq \mathbb{R}^3$
(b) $\{(x, y) \in \mathbb{R}^2 : x^2 - x = 0\} \subseteq \{(x, y) \in \mathbb{R}^2 : x - 1 = 0\}$

5. Moved to HW3

6. You have two strings of fuse. When lit at one end, each will burn for exactly one hour. The fuses are not necessarily identical, though, and do not burn at a constant rate. All you have with you is a lighter and these two fuses. Can you measure exactly 45 minutes? If so, explain how. If not, explain why.