

CSE 2500-03: Homework 1  
Due September 15, 2017  
(before start of lecture)

November 28, 2017

1. (10 points) Restate the statement “Every positive number has a positive square root” by filling in the blank:
  - (a) All positive numbers have \_\_\_\_\_.
  - (b) For a positive number  $e$ , there is \_\_\_\_\_ for  $e$ .
  - (c) For all positive numbers  $e$ , there is a positive number  $r$  such that \_\_\_\_\_.
2. (20 points)
  - (a) Is  $2 \in \{2\}$ ?
  - (b) How many elements are in the set  $\{2, 2, 2, 2\}$ ?
  - (c) How many elements are in the set  $\{0, \{0\}\}$ ?
  - (d) Is  $\{0\} \in \{\{0\}, \{1\}\}$ ?
  - (e) Is  $0 \in \{\{0\}, \{1\}\}$ ?
3. (15 points) Let  $S = \{1, 3, 10, 20\}$  and  $T = \{1, 10\}$ .
  - (a) Is  $\emptyset \subseteq S$ ?
  - (b) Is  $\emptyset \subseteq T$ ?
  - (c) Is  $S \subseteq T$ ?
  - (d) Is  $T \subseteq S$ ?
  - (e) Is  $T \subset S$ ? How is this question different from part d)?
4. (10 points) Let  $S = \{2, 4, 6\}$  and  $T = \{1, 3, 5\}$ . Use the set-roster notation to write the following sets:
  - (a)  $S \times T$ .
  - (b)  $S \times S$ .
5. (25 points) Let  $G = \{-2, 0, 2\}$  and  $H = \{4, 6, 8\}$  and define a relation  $V$  from  $G$  to  $H$  as follows: for all  $(x, y) \in G \times H$ :  $(x, y) \in V$  if  $(x - y)/4$  is an integer. Answer the following:

- (a) Is  $2V6$ ?
  - (b) Is  $(-2)V(-6)$ ?
  - (c) Is  $(0, 6) \in V$ ?
  - (d) Is  $(2, 4) \in V$ ?
  - (e) Write  $V$  as a set of ordered pairs.
  - (f) Write the domain and co-domain of  $V$ .
  - (g) Draw an arrow diagram for  $V$ .
6. (10 points) Let  $X = \{2, 4, 5\}$  and  $Y = \{1, 2, 4, 6\}$ . For each of the following relations draw an arrow diagram and say whether the relation is a function
- (a)  $R = \{(2, 6), (4, 2), (5, 2)\}$ .
  - (b)  $V = \{(2, 4), (4, 1), (4, 2), (5, 6)\}$ .
7. (10 points) Define functions  $H$  and  $K$  from  $\mathbb{R}$  to  $\mathbb{R}$  by the following formulae: for all  $x \in \mathbb{R}$

$$H(x) = (x - 2)^2.$$

$$K(x) = (x - 1)(x - 3) + 1.$$

Are these the same function? Why or why not.