

## Solutions

1. (2 points) Express the set  $\{x \in \mathbb{R} \mid |x| \geq 2\}$  in interval notation.

**Solution:**

$$(-\infty, -2] \cup [2, \infty)$$

2. (3 points) Consider the sets  $A = \{a, b, c, d\}$  and  $B = \{1, 2, 3, 4\}$ . Define  $f : A \rightarrow B$  by  $f(a) = 2$ ,  $f(b) = 3$ ,  $f(c) = 1$ ,  $f(d) = 2$ . Is  $f$  a function? If so, is it onto? Is it 1 to 1?

**Solution:**

Yes,  $f$  is a function since it assigns one element of  $B$  to each element of  $A$ . It is not onto since no element of  $A$  maps to 4. It is not 1 to 1 since  $a$  and  $d$  both map to 2.

3. (2 points) The notation  $2|x$  means “2 divides  $x$ ” or “ $x$  is divisible by 2”. Describe the elements of the set:  $\{x \in \mathbb{Z} \mid 2|x\} \cap \{y \in \mathbb{Z} \mid 3|y\}$

**Solution:**

Any of the following are acceptable answers:

Integers divisible by 2 and by 3.

Integers divisible by 6.

$$\{z \in \mathbb{Z} \mid 6|z\}$$

$$\{z \in \mathbb{Z} \mid 2|z \text{ and } 3|z\}$$

$\dots, -12, -6, 0, 6, 12, \dots$  (ok to have more or less terms, must have dots in both directions)

4. (3 points) You drive from home to store A, from store A directly to store B, and then from store B back home. The distance from store A to home is one mile more than the distance from store B to home. The distance from store A to store B is 5 miles. If you traveled a total of 12 miles, how far is store A from home?

**Solution:**

The distance from home to store A is 4 miles.

Let  $a$ =distance from store A to home, let  $b$ =distance from store B to home, then:  $a + b + 5 = 12$  and  $a = b + 1$ . The second equation tells us that  $b = a - 1$ . If we substitute this in to the first equation then:

$$a + (a - 1) + 5 = 12 \implies 2a + 4 = 12 \implies 2a = 8 \implies a = 4$$

It's ok to guess that  $a = 4$  and  $b = 3$  as long as you then verify that the conditions of the problem are satisfied.