

**2.3.4** Use set builder notation to specify the following sets:

1. The set of all integers greater than or equal to 5.
2. The set of all even integers.
3. The set of all positive rational numbers.
4. The set of all real numbers greater than 1 and less than 7.

**2.4.3** Assume the universal set for each variable is the set of integers. Write each of the following statements as an English sentence that does not use the symbols for quantifiers.

1.  $(\exists m)(\exists n)(m > n)$
2.  $(\exists m)(\forall n)(m > n)$
3.  $(\forall m)(\exists n)(m > n)$
4.  $(\forall m)(\forall n)(m > n)$
5.  $(\exists n)(\forall m)(m^2 > n)$
6.  $(\forall n)(\exists m)(m^2 > n)$

**3.1.8** Determine if each of the following propositions is true or false. Justify each conclusion.

1. For all integers  $a$  and  $b$ , if  $ab \equiv 0 \pmod{6}$ , then  $a \equiv 0 \pmod{6}$  or  $b \equiv 0 \pmod{6}$ .
2. For all  $a \in \mathbb{Z}$ , if  $a^2 \equiv 4 \pmod{8}$ , then  $a \equiv 2 \pmod{8}$ .