Algebraic Specifications for Set of items (independent of item type)

NEW creates a new set
ADD adds an item to the set (no duplicates)
IN returns whether or not item is in the set
REMOVE removes the item from the set if it's there
UNION combines two sets into one (eliminating duplicates)
INTERSECT creates a set with elements that are in both of two sets
EMPTY returns whether or not the set is empty
DIFF returns elements of first set that are not in second set

Syntax:

<table>
<thead>
<tr>
<th>operation</th>
<th>domain</th>
<th>range</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW</td>
<td>( ) --&gt; SET</td>
<td>SET</td>
</tr>
<tr>
<td>ADD</td>
<td>(SET, ITEM) -- &gt; SET</td>
<td>SET</td>
</tr>
<tr>
<td>IN</td>
<td>(SET, ITEM) -- &gt; BOOL</td>
<td>BOOL</td>
</tr>
<tr>
<td>REMOVE</td>
<td>(SET, ITEM) -- &gt; SET</td>
<td>SET</td>
</tr>
<tr>
<td>UNION</td>
<td>(SET, SET) -- &gt; SET</td>
<td>SET</td>
</tr>
<tr>
<td>INTERSECT</td>
<td>(SET, SET) -- &gt; SET</td>
<td>SET</td>
</tr>
<tr>
<td>EMPTY</td>
<td>(SET) -- &gt; BOOL</td>
<td>BOOL</td>
</tr>
<tr>
<td>DIFF</td>
<td>(SET, SET) -- &gt; SET</td>
<td>SET</td>
</tr>
</tbody>
</table>

The Axioms:

(s and t are of type SET and i and j are of type ITEM)

essential builders are NEW and ADD:

1) EMPTY(NEW) = true
2) EMPTY(ADD(s,i)) = false
3) IN(NEW, i) = false
4) IN(ADD(s,i), j) = if i = j then true else IN(s, j) you need to add it somewhere
5) REMOVE(NEW, i) = NEW
6) REMOVE(ADD(s,i), j) = if i=j then REMOVE(s, j) else ADD(REMOVE(s, j), i)
7) UNION(NEW, t) = t
8) UNION(ADD(s,i), t) = UNION(s, ADD(t,i))
9) INTERSECT(NEW, t) = NEW
10 INTERSECT(ADD(s,i), t) = if IN(t,i) then ADD.INTERSECT(s,t, i) else INTERSECT(s,t)
11) DIFF(s,NEW) = s
12) DIFF(s, ADD(t,i)) = REMOVE(DIFF(s, t), i) or DIFF(REMOVE(s,i), t)

Each of the other functions is composed with each essential builder (NEW, ADD).
Then describe the actions in terms of the other functions.