Prob. 1	Prob. 2

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Problem 1.

For all edges (a,b) in a spread set S, either $a \in S \,\&\, b \notin S$ *or* $b \in S \,\&\, a \notin S$ *or* $a \notin S \,\&\, b \notin S$. In other words, at most one of (a,b) is in S.

Let's take the complement of a spread set, for each case:
$a \in S \,\&\, b \notin S -> \; a \notin S \,\&\, b \in S$
$a \notin S \,\&\, b \in S -> \; a \in S \,\&\, b \notin S$
$a \notin S \,\&\, b \notin S -> \; a \in S \,\&\, b \in S$

In all three cases, at least one of (a,b) is in S. This is the definition of a vertex cover.

This means that $SPREAD\_SET$ can be rephrased in the following way:
Given a graph G of size n and a size k:
1) Find a vertex cover for G of size $(n-k)$
2) Take the complement of that vertex cover.

Step 2 is obviously polynomial, therefore $VERTEX\_COVER$ can be reduced to $SPREAD\_SET$. Since $VERTEX\_COVER$ is NP-complete, $SPREAD\_SET$ must also be NP-complete

Problem 2.

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