

Name: \_\_\_\_\_

HW7 Worksheet

**PLEASE ANSWER THESE QUESTIONS ON A SEPARATE SHEET OF PAPER TO BE TURNED IN**

In the following problems, assume everyone starts with product  $B$ , except for a set of nodes  $S$  who are early adopters of product  $A$  (and will never switch to product  $B$ ). At every time step  $t_i$ , each node has the opportunity to switch from product  $B$  to product  $A$ , which they will do if **at least a proportion  $q$**  of their neighbors are using product  $A$ . Your task is to denote which nodes switch to product  $A$  at each time step, until no more nodes will switch. For example, for the graph in problem 8, if  $S = \{14, 11\}$  and  $q = 0.75$ , then your answer should be:

$t_1: 14, 11$

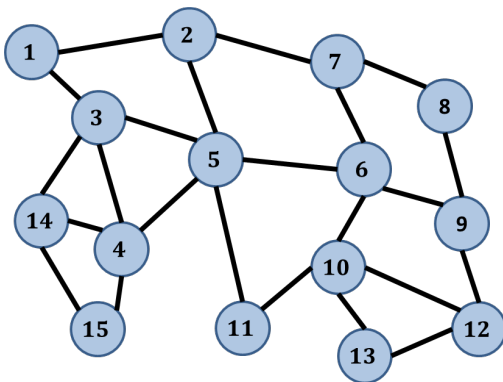
$t_2: 15$

$t_3: \emptyset$

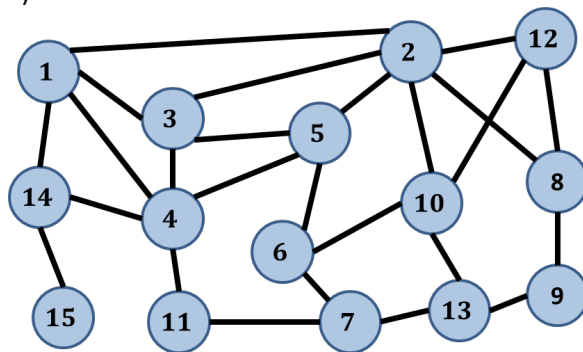
In other words, for  $t_1$  you simply write the vertices of  $S$ , then for each successive time step, write the new adopters. Stop when you reach the first time step when there are no more new adopters.

- a)  $S = \{1, 5, 7, 9\}$  and  $q = 0.1$
- b)  $S = \{1, 5, 7, 9\}$  and  $q = \frac{1}{4}$
- c)  $S = \{1, 5, 7, 9\}$  and  $q = \frac{1}{3}$
- d)  $S = \{2, 13, 15\}$  and  $q = 0.1$

1)



2)



In the following problems, you will be given  $S$ , the set of early adopters of  $A$ . Your task is to find the **smallest**  $q$  that causes the cascade to reach **all** nodes.

- a)  $S = \{1\}$
- b)  $S = \{5, 10, 12\}$
- c)  $S = \{7, 13, 15\}$
- d)  $S = \{4, 6, 13\}$
- e)  $S = \{3, 8, 11\}$

3) Use the graph from Figure 1).

4) Use the graph from Figure 2).