

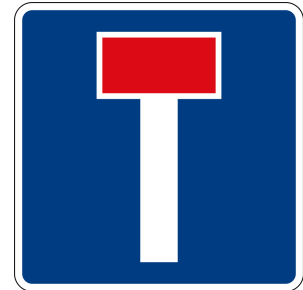
# Problem E

## Dead-End Detector

Time limit: 5 seconds

The council of your home town has decided to improve road sign placement, especially for dead ends. They have given you a road map, and you must determine where to put up signs to mark the dead ends. They want you to use as few signs as possible.

The road map is a collection of locations connected by two-way streets. The following rule describes how to obtain a complete placement of dead-end signs. Consider a street  $S$  connecting a location  $x$  with another location. The  $x$ -entrance of  $S$  gets a dead-end sign if, after entering  $S$  from  $x$ , it is not possible to come back to  $x$  without making a U-turn. A U-turn is a 180-degree turn immediately reversing the direction.



A dead-end sign.  
Source: [Wikimedia Commons](#)

To save costs, you have decided not to install redundant dead-end signs, as specified by the following rule. Consider a street  $S$  with a dead-end sign at its  $x$ -entrance and another street  $T$  with a dead-end sign at its  $y$ -entrance. If, after entering  $S$  from  $x$ , it is possible to go to  $y$  and enter  $T$  without making a U-turn, the dead-end sign at the  $y$ -entrance of  $T$  is redundant. See Figure E.1 for examples.

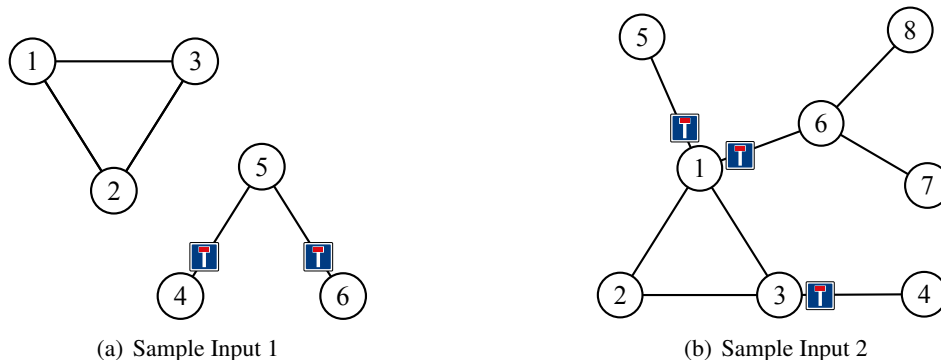


Figure E.1: Illustration of sample inputs, indicating where non-redundant dead-end signs are placed.

## Input

The first line of input contains two integers  $n$  and  $m$ , where  $n$  ( $1 \leq n \leq 5 \cdot 10^5$ ) is the number of locations and  $m$  ( $0 \leq m \leq 5 \cdot 10^5$ ) is the number of streets. Each of the following  $m$  lines contains two integers  $v$  and  $w$  ( $1 \leq v < w \leq n$ ) indicating that there is a two-way street connecting locations  $v$  and  $w$ . All location pairs in the input are distinct.

## Output

On the first line, output  $k$ , the number of dead-end signs installed. On each of the next  $k$  lines, output two integers  $v$  and  $w$  marking that a dead-end sign should be installed at the  $v$ -entrance of a street connecting locations  $v$  and  $w$ . The lines describing dead-end signs must be sorted in ascending order of  $v$ -locations, breaking ties in ascending order of  $w$ -locations.

### Sample Input 1

```
6 5
1 2
1 3
2 3
4 5
5 6
```

### Sample Output 1

```
2
4 5
6 5
```

### Sample Input 2

```
8 8
1 2
1 3
2 3
3 4
1 5
1 6
6 7
6 8
```

### Sample Output 2

```
3
1 5
1 6
3 4
```