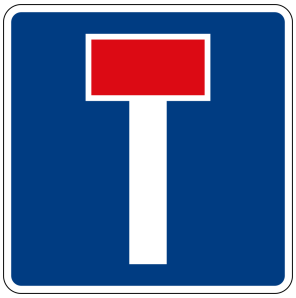
Problem E
Dead-End Detector
Time limit: 5 seconds

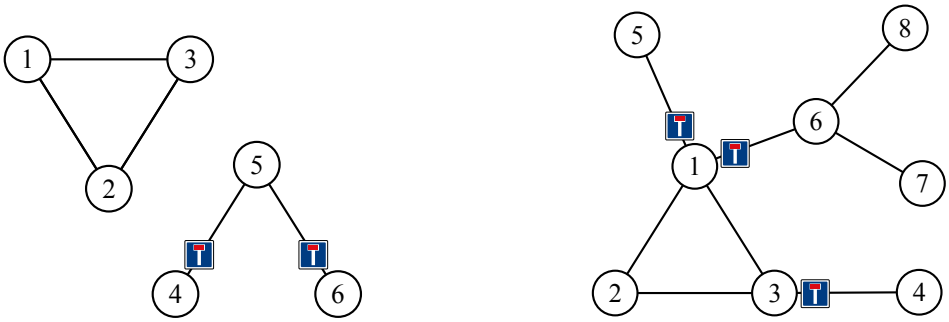
The council of your home town has decided to improve road sign placement, especially for dead ends. They have given you a road map, and you must determine where to put up signs to mark the dead ends. They want you to use as few signs as possible.



A dead-end sign.
Source: Wikimedia Commons

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.

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.



(a) Sample Input 1 (b) Sample Input 2

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
```