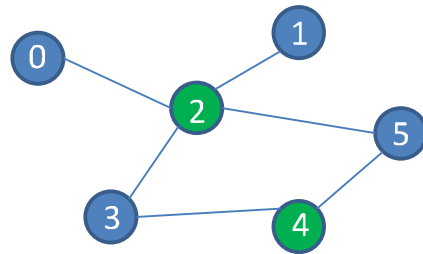


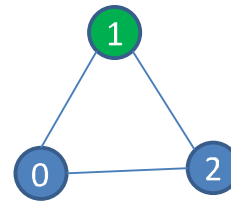
Homework #9

Vertex Coloring

(Due:2022/1/14)



two-colorable



not two-colorable

Vertex coloring is the assignment of color labels to vertices in an undirected graph such that no two vertices sharing the same edge have the same color. An undirected graph is said to be **two-colorable** if an assignment using at most two colors can be found for the graph. For instance, the graph on the left-hand side in the figure above is two-colorable. The graph on the right-hand side in the figure above is not two-colorable.

In this homework, you need to write a program to determine if an undirected graph is two-colorable. If it is two-colorable, your program also needs to output the color label of each vertex.

Hint: the problem can be solved in polynomial time with BFS

As an example, for the two-colorable graph above, you will be given

```
6
0 2
2 1
2 5
2 3
4 3
5 4
```

First line 6 mean there is 6 edges, the following 6 line indicate which two vertex is connect by each edge.

If the graph is two-colorable, you need to print out the set of vertex contain vertex 0 in ascending order.

Example:

```
blue_nodes = {3,1,0,5}
green_nodes = {2,4}
```

You should print out:

```
0,1,3,5
```

For the other graph that is not two-colorable, you only need to print out -1.

Constrains:

The total number of graph < 20

The number of edge < 100

Upload your code to Code Sensor

The page on code sensor for this homework is at

https://codesensor.cs.nycu.edu.tw/2021_hw9_vertex_coloring

Note:

1. You should not include the following header files in your code.

`mman.h, valgrind.h, callgrind.h, ptrace.h, signal.h`

2. You should not directly / indirectly use the following system calls in your code.

`"mmap", "mprotect", "munmap", "syscall", "fork", "vfork", "clone", "system", "creat", "open", "mknod", "mknodat"`

3. Inline assembly is not supported.
4. For submissions that have identical performance metrics, there has to be convincing evidence of coincidence (e.g. your source codes do look different). Otherwise, you will get 0 points for the homework.
5. Don't be shy of asking questions. You can come to me or the TAs if you have any questions regarding the homework or C/C++ programming.