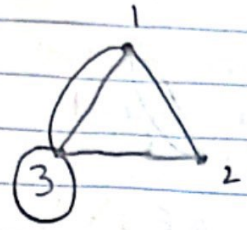
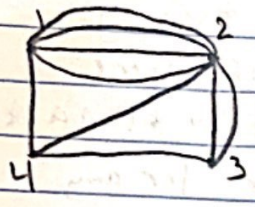
Larry Vo
OKay

1.



$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & 1 \\ 2 & 1 & 1 \end{bmatrix}$$

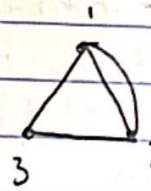
Sum of rows is odd, even, even
So neither Eulerian path nor Eulerian cycle.



$$\begin{bmatrix} 0 & 4 & 0 & 1 \\ 4 & 0 & 2 & 1 \\ 0 & 2 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

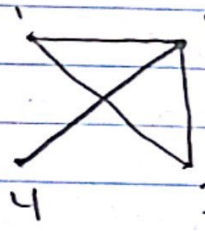
Sum of each row is odd, odd, odd, odd
So neither Eulerian path nor Eulerian cycle

2.



$$\begin{bmatrix} 0 & 2 & 1 \\ 2 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

We get odd, odd, even so Eulerian path but not Eulerian cycle.



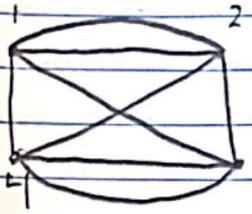
$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

even, odd, even, odd
So Eulerian path but not Eulerian cycle.

3.

$$\begin{bmatrix} 0 & 2 & 2 \\ 2 & 0 & 2 \\ 2 & 2 & 0 \end{bmatrix}$$

even, even, even so Eulerian cycle.



$$\begin{bmatrix} 0 & 2 & 1 & 1 \\ 2 & 0 & 1 & 1 \\ 1 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$$

even, even, even, even so Eulerian cycle.

4. If you start at a vertex and want to travel along each edge exactly once and end up at the beginning vertex then for each vertex you would have to go in and out which means there must be an even amount of edges coming out of each vertex if you want to go through each edge exactly once. Thus the condition for Eulerian cycle is to have a even number of edges for each vertex.

5. Same rules but this time we start at a vertex and end at a different vertex. Same thing as before, each vertex is going to go in and out so it is even except for the beginning and end vertex which we have an extra edge or lose an edge b/c we are going out of the beginning and not going back in and at the end we are going in but not back out. So every vertex has an even degree except the beginning and end which have odd degrees thus the necessary condition for Eulerian path.