# Homework 1

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## 1

1) The maximum number of edges that a simple graph can have is $\frac{n(n-1)}{2}$
2) The maximum number of edges that a simple graph can have is $(n-1)$

## 2

This graph is not a stronly connected graph. This is because Vertex B and E does not have a path that directly leads to them.

## 3

This simple graph is not a bipartite graph. This is beause it is not possible to generate two subset graphs that within the same set are adjacent

## 4

from the graph we can see that node 1, 2, 6 and 7 are symmetric to each other. Node 3 and 5 are also symetric.

$$C_{1,2,6,7} = \frac{7}{0+1+1+2+3+4+4} \quad C_{3,5} = \frac{7}{1+1+0+1+2+3+3} \quad C_4 = \frac{7}{2+2+1+0+1+2+2}$$

$$C_{1,2,6,7} = \frac{7}{15} \quad C_{3,5} = \frac{7}{11} \quad C_4 = \frac{7}{10}$$

so we can say that the Closeness of nodes 1,2,6,7 are $\frac{7}{15}$, nodes 3 and 5 are $\frac{7}{11}$ and node 4 is $\frac{7}{10}$

# 5

Just by looking at the graph, we can tell that the betweeness for Node 1,3,4,5 are zero.

$$
\begin{aligned}
B_2 &= \frac{1}{\binom{5-1}{2}} * (\frac{0}{1} + \frac{1}{1} + \frac{1}{1} + \frac{1}{1} + \frac{1}{1} + \frac{1}{1}) \\
B_2 &= \frac{1}{\binom{4}{2}} * (0 + 1 + 1 + 1 + 1 + 1) \\
B_2 &= \frac{1}{6} * (5) \\
B_2 &= \frac{5}{6}
\end{aligned}
$$

So the Betweeness of nodes 1,3,4,5 are zero and the betweeness of node 2 is $\frac{5}{6}$

# 6