

Introdução à Teoria dos Grafos

Prof. Alexandre Noma

O que é um Grafo?

- Redes Sociais



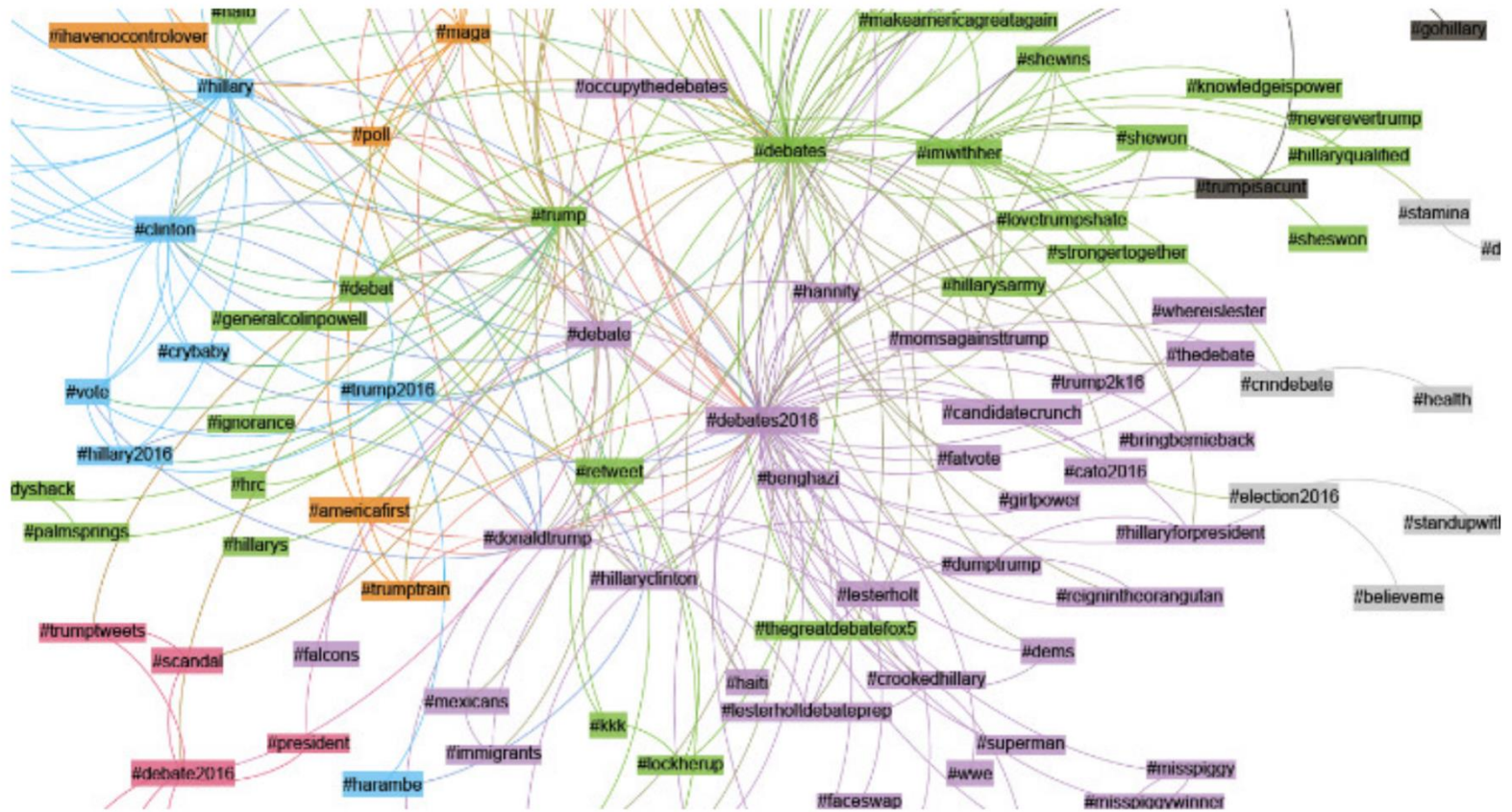
Artigos



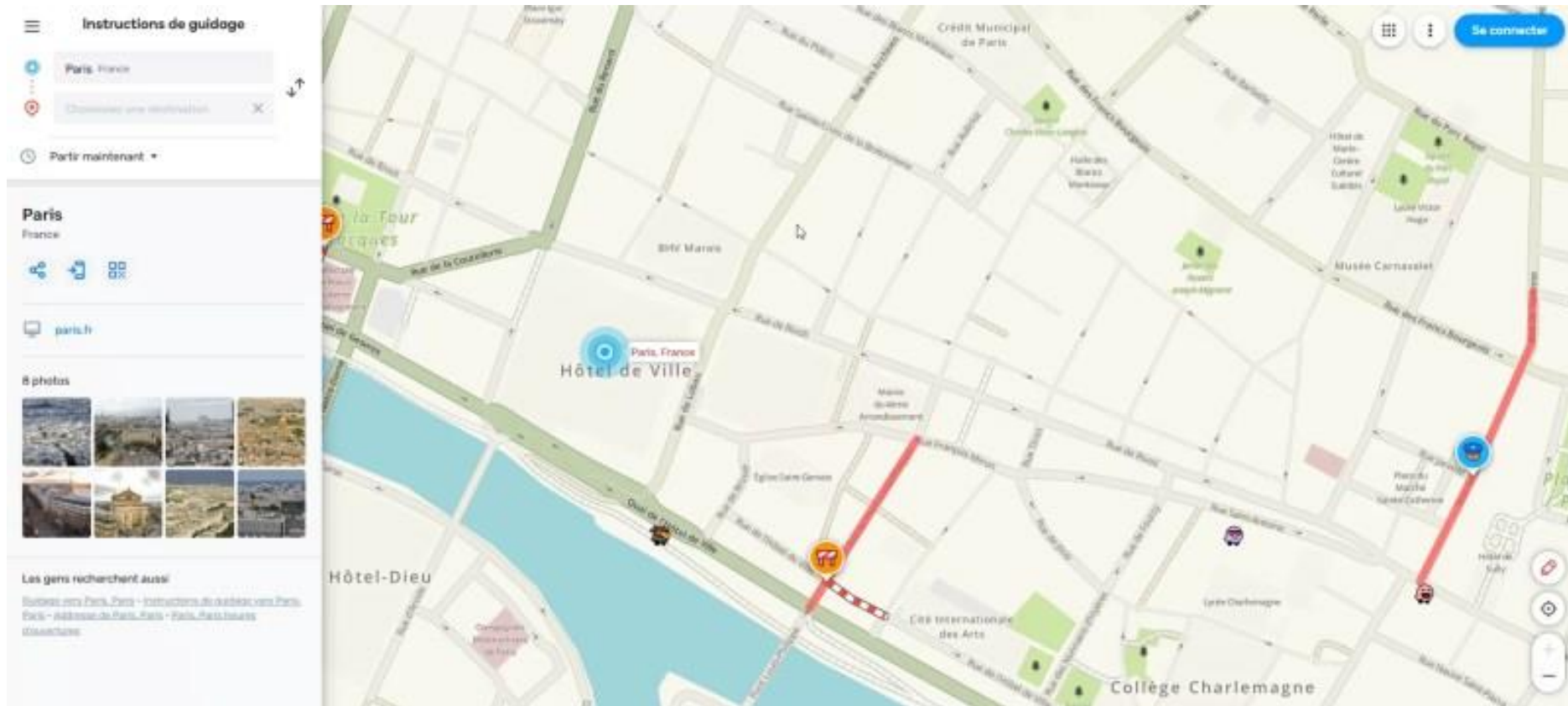
Pessoas



Learning



- GPS



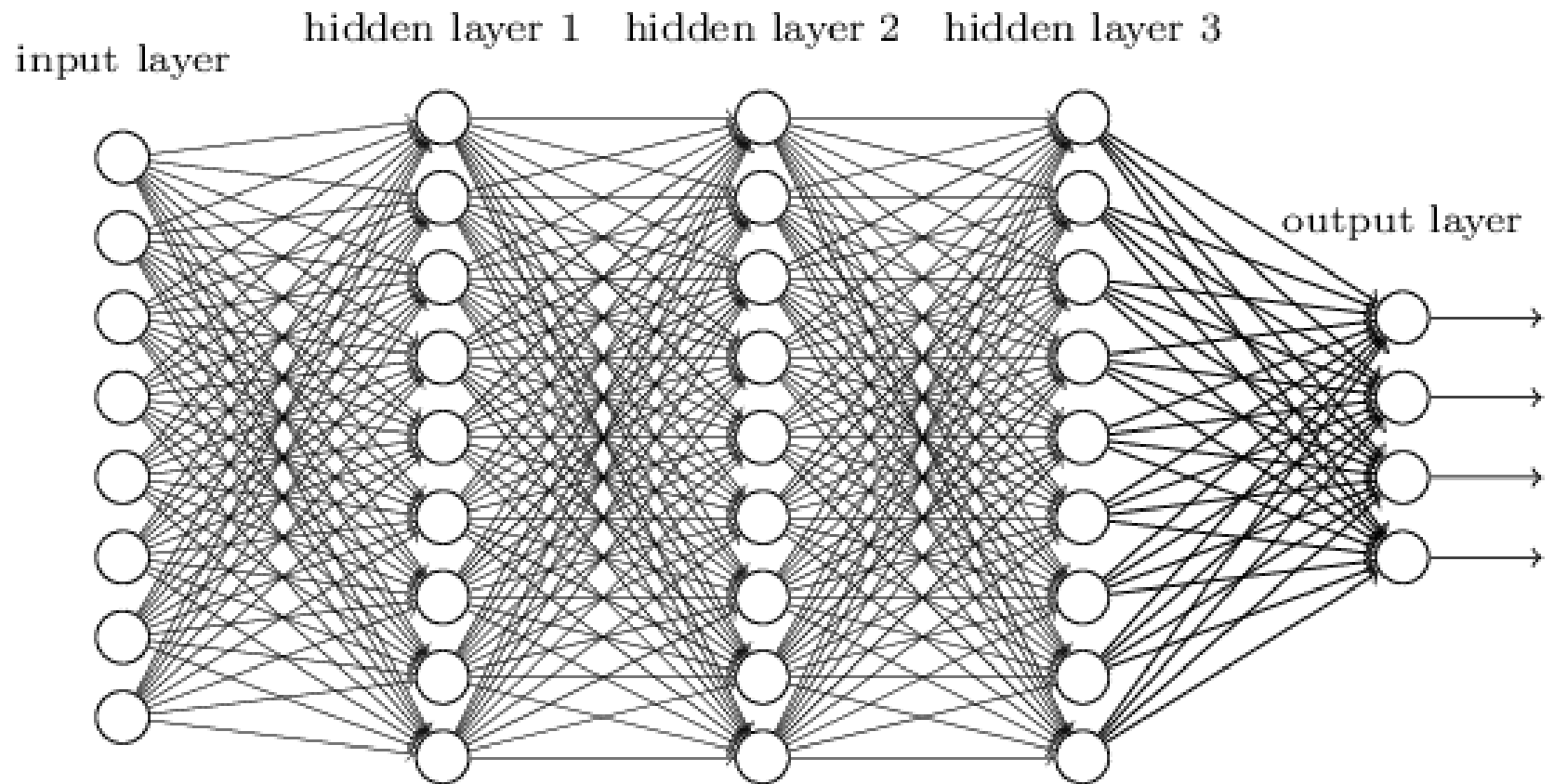
- Imagens



[PDF] Modelagem por redes (grafos) e técnicas de reconhecimento de padrões: estrutura, dinâmica e aplicações

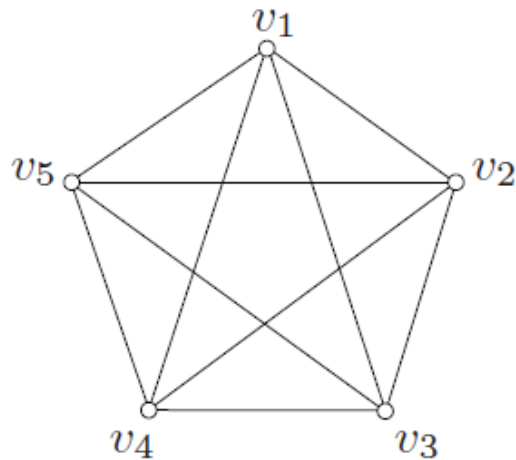
Visit >

- Redes neurais

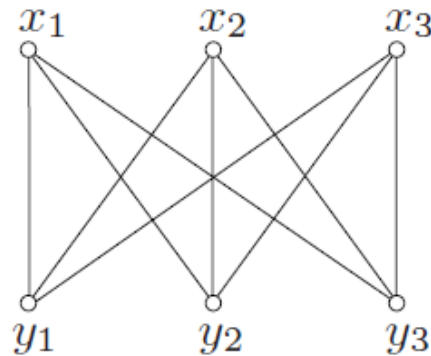


O que é um Grafo?

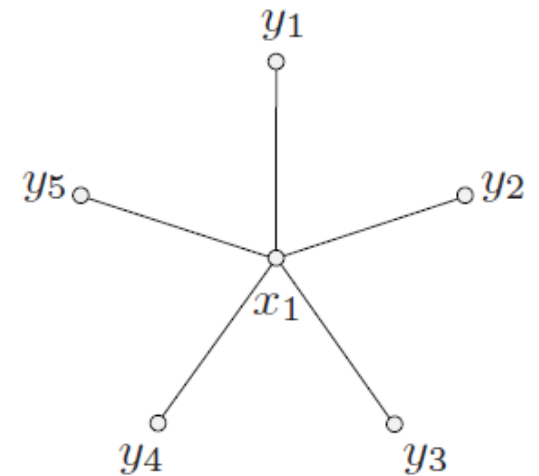
- É formado por **vértices** e **arestas**: $G = (V, E)$



(a)



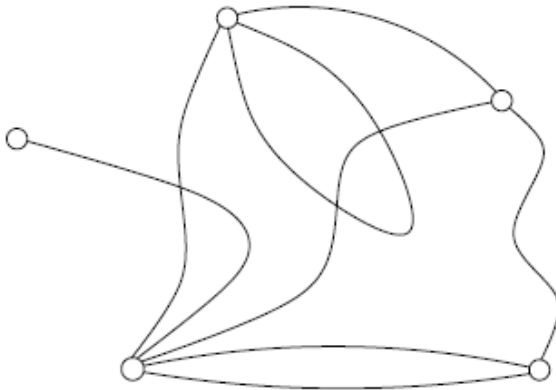
(b)



(c)

O que é um Grafo?

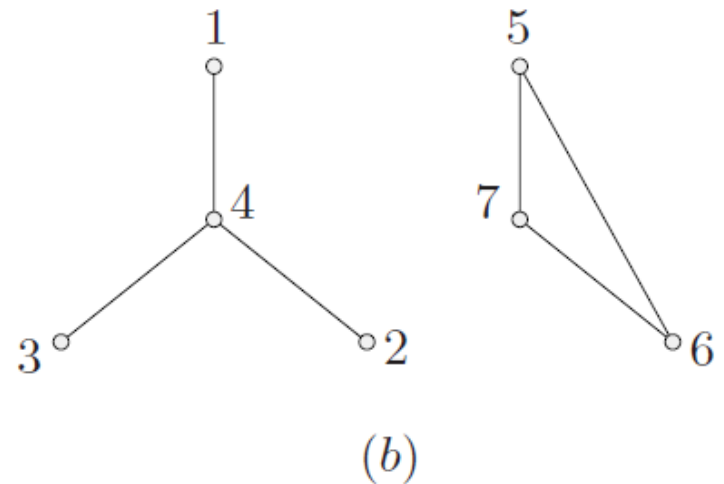
- Pode conter **loops** e arestas paralelas.



(a)

O que é um Grafo?

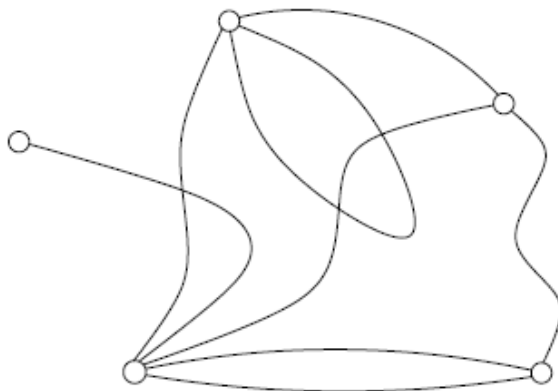
- Pode ser desconexo.



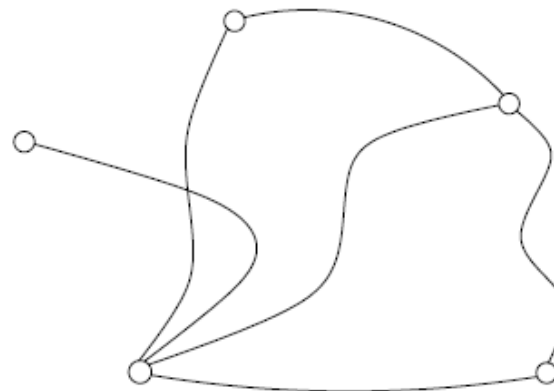
Algumas propriedades

- Um grafo pode ser
 - simples
 - completo
 - bipartido
 - conexo

- Um grafo é **simples** se
 - não tem **loops**
 - nem **arestas paralelas**

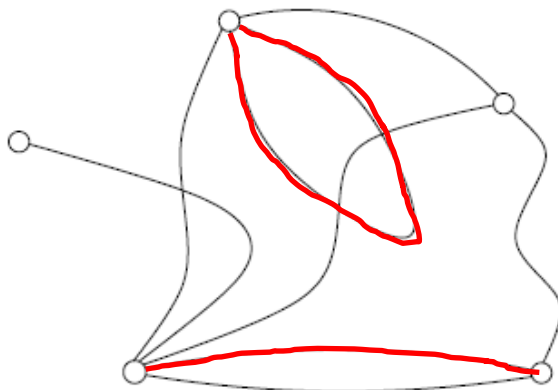


(a)

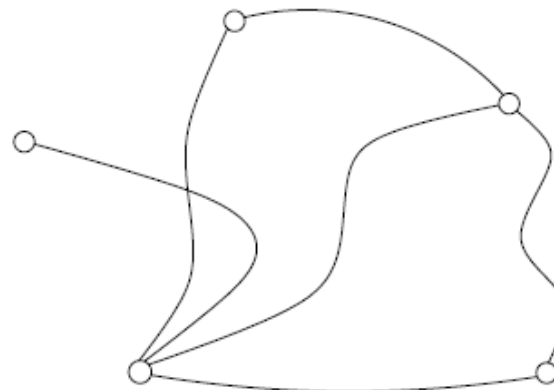


(b)

- Um grafo é **simples** se
 - não tem **loops**
 - nem **arestas paralelas**

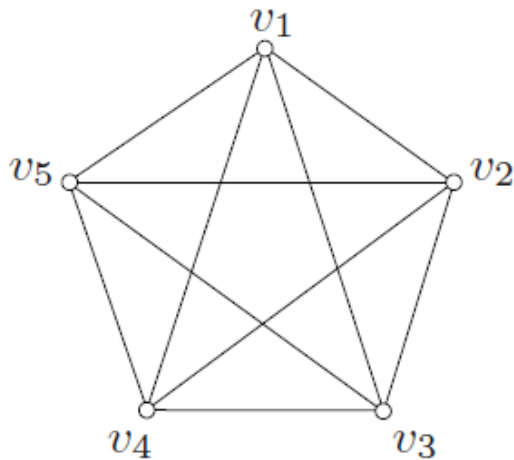


(a) ❌



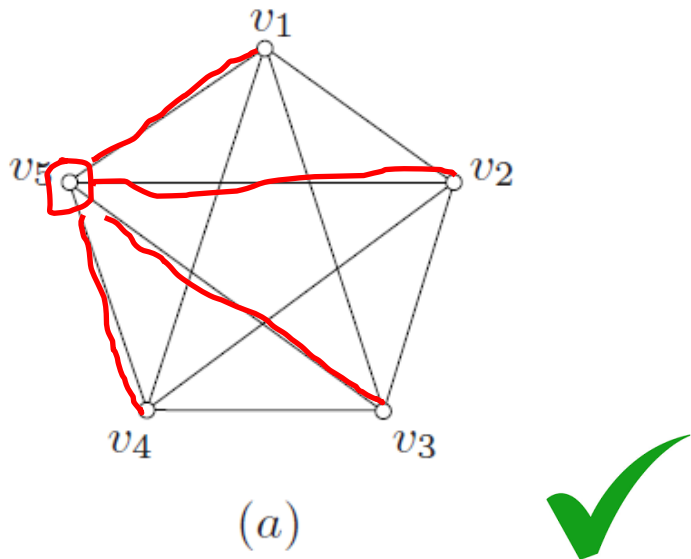
(b) ✅

- Um grafo é **completo** se todos os pares de vértices (distintos) são conectados.

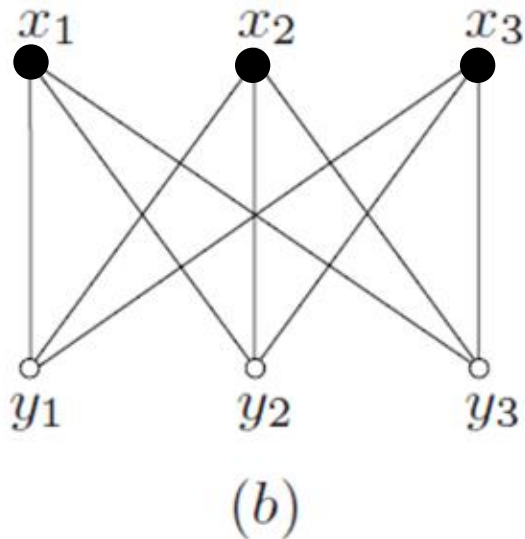


(a)

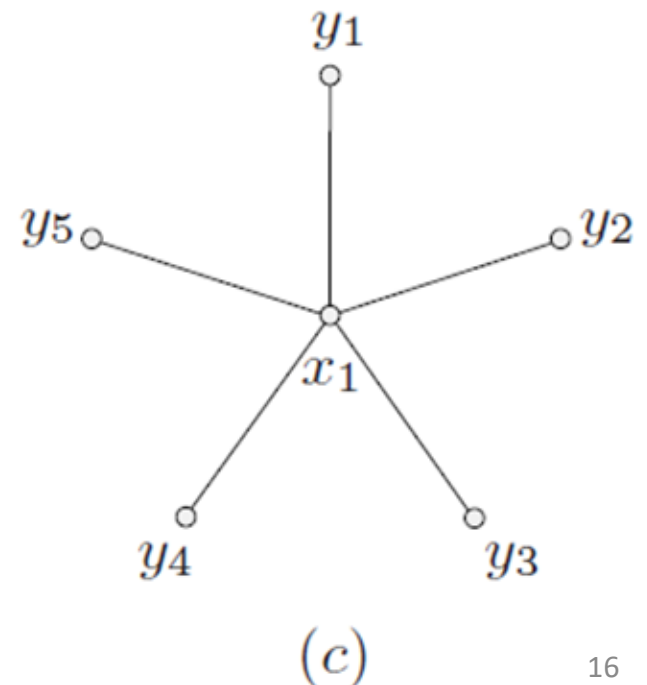
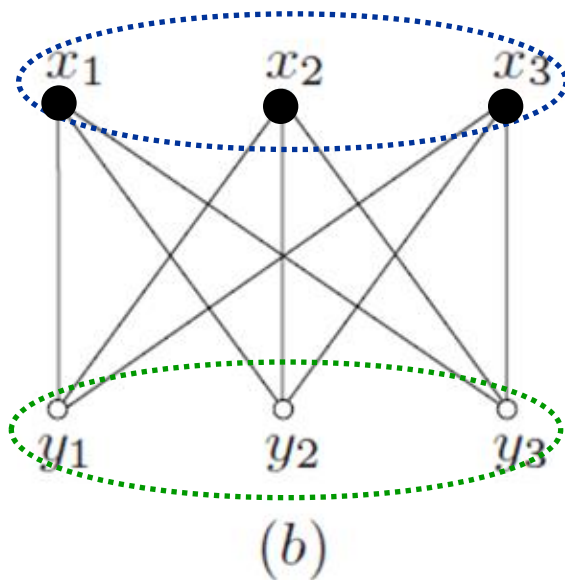
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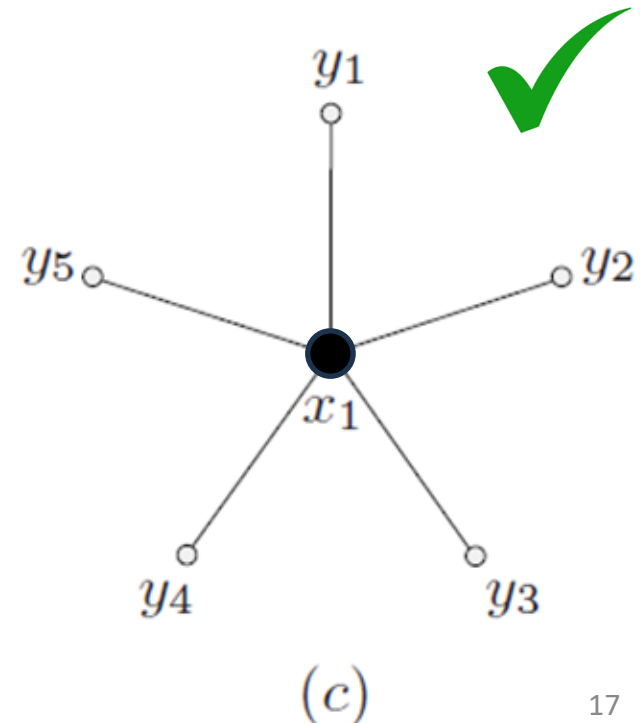
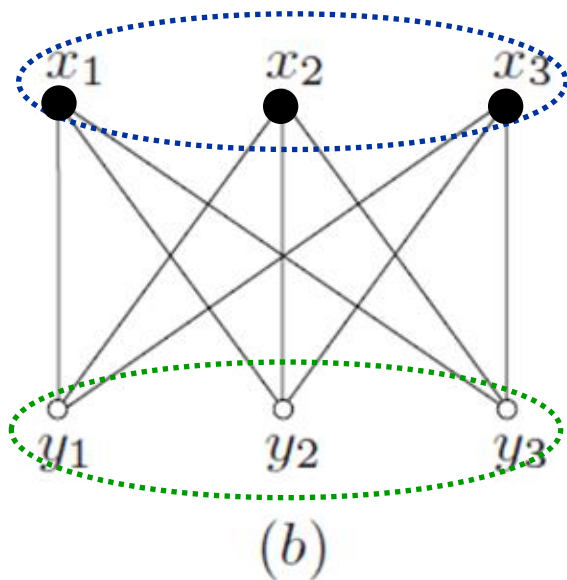
- Um grafo é **bipartido** se V pode ser particionado em dois subconjuntos de vértices...



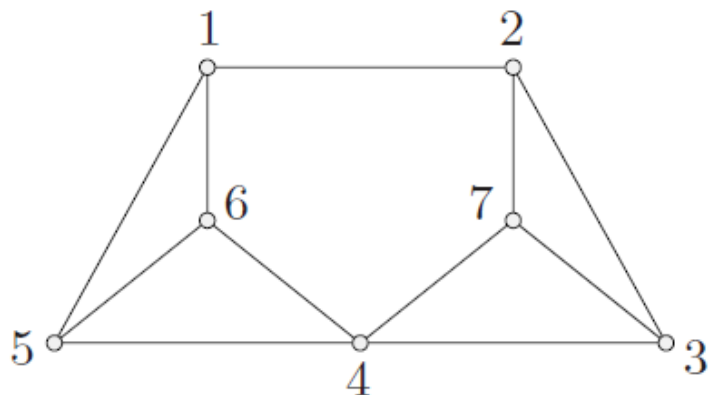
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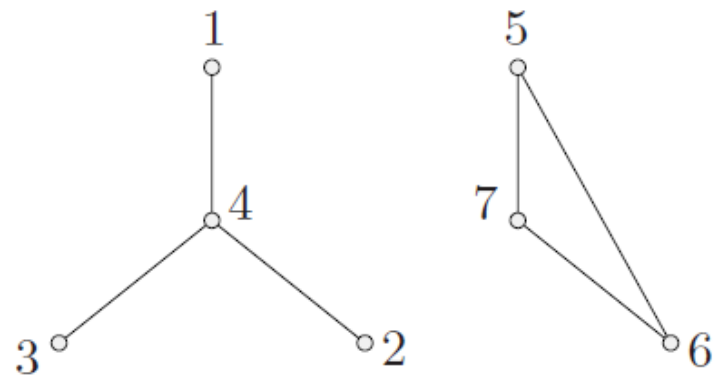
- Um grafo é **bipartido** se V pode ser particionado em dois subconjuntos de vértices...



- Um grafo é **conexo** se ele é formado por um único **componente**.

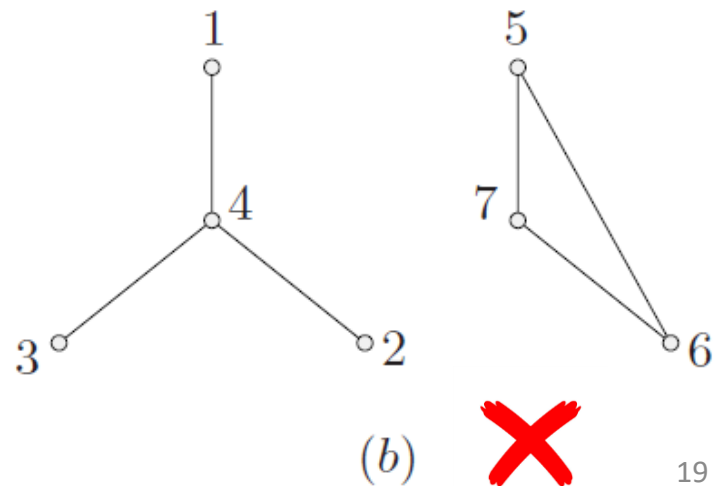
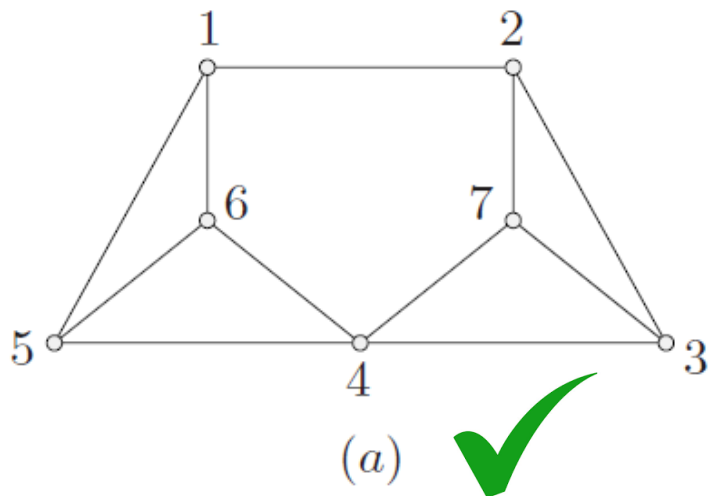


(a)



(b)

- Um grafo é **conexo** se ele é formado por um único **componente**.



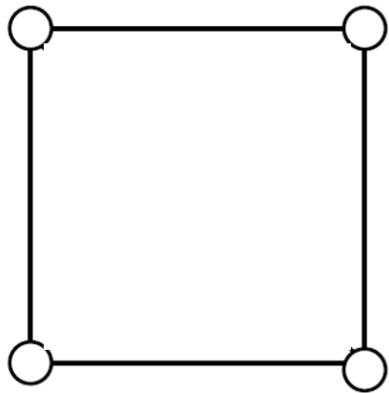
Revisão

- O que é um grafo?
 - simples?
 - completo?
 - bipartido?
 - conexo?

Mais algumas propriedades de grafos:

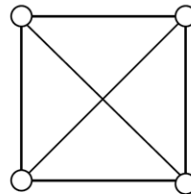
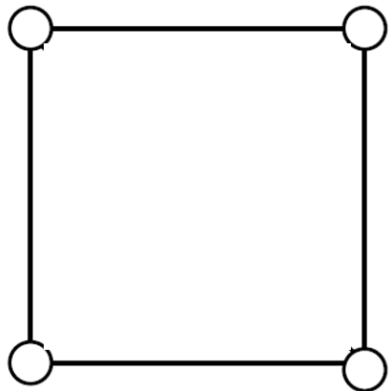
- complemento
- planaridade
- isomorfismo

– Complemento de um grafo



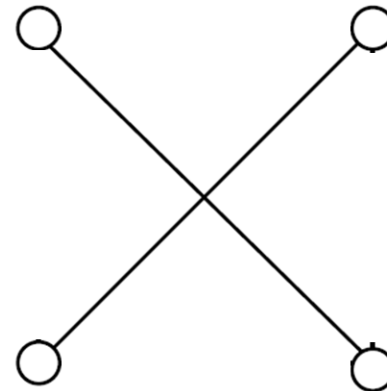
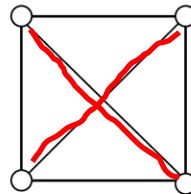
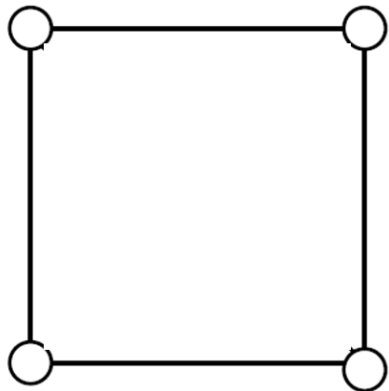
?

– Complemento de um grafo

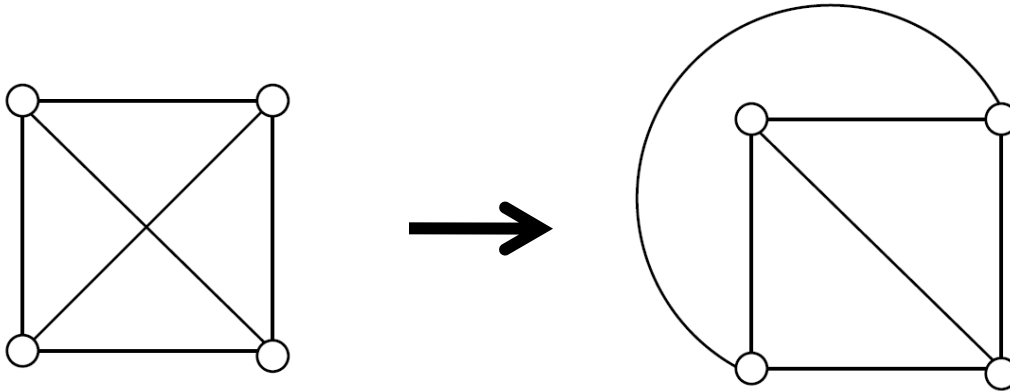


?

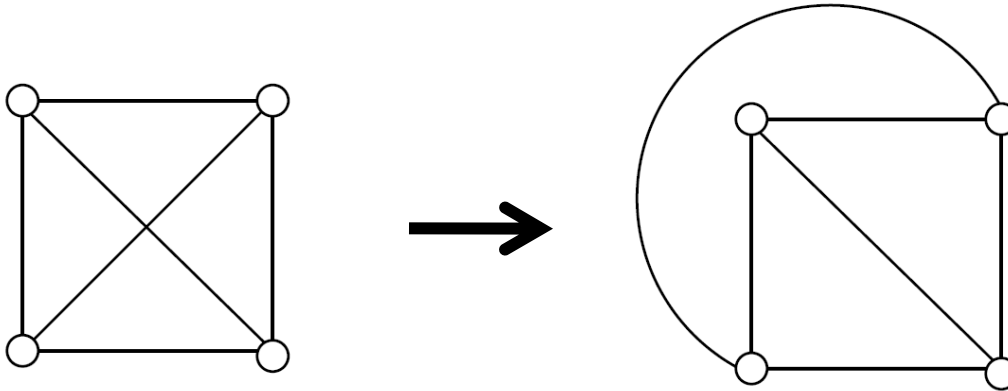
– Complemento de um grafo



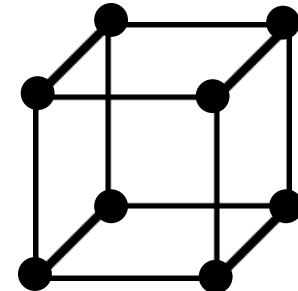
- Um grafo é **planar** se existe um desenho no plano sem **cruzamentos** de arestas.



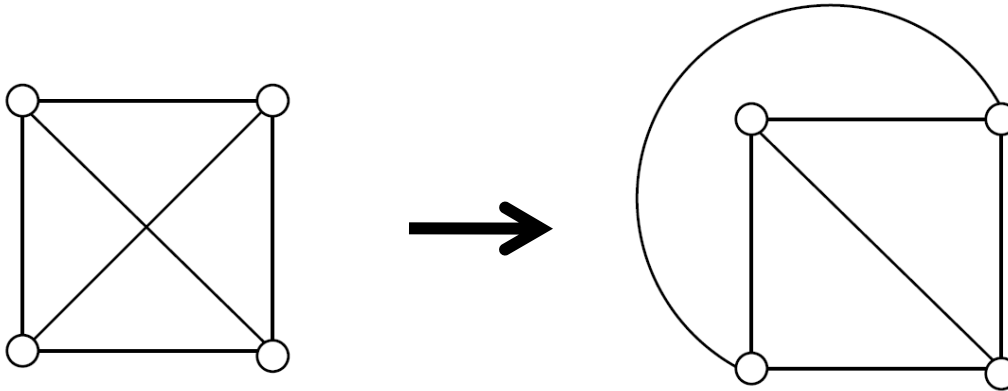
- Um grafo é **planar** se existe um desenho no plano sem **cruzamentos** de arestas.



- Pergunta**
 - O grafo de um cubo é planar?

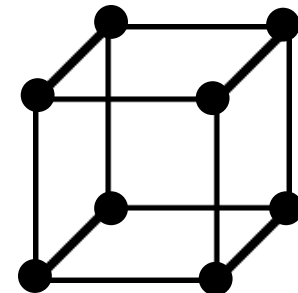


- Um grafo é **planar** se existe um desenho no plano sem **cruzamentos** de arestas.

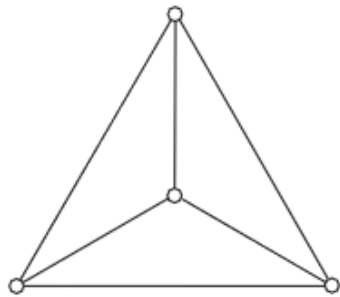


- Pergunta**

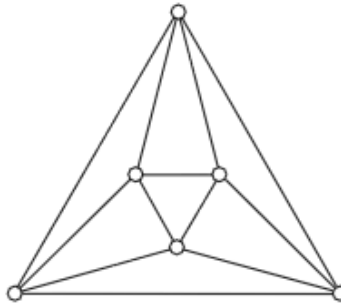
- O grafo de um cubo é planar? **SIM.**



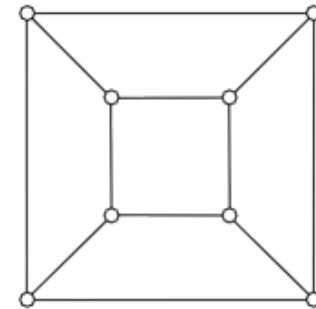
- Exemplos: Grafos planares



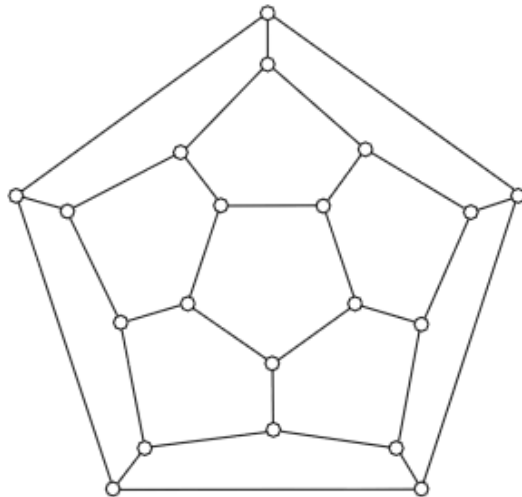
(a)



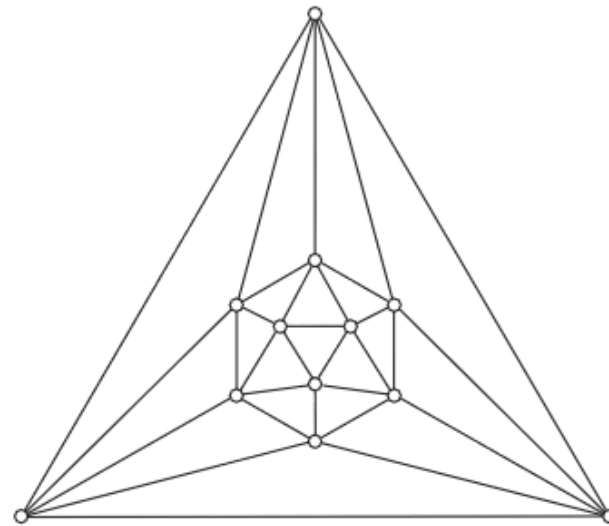
(b)



(c)

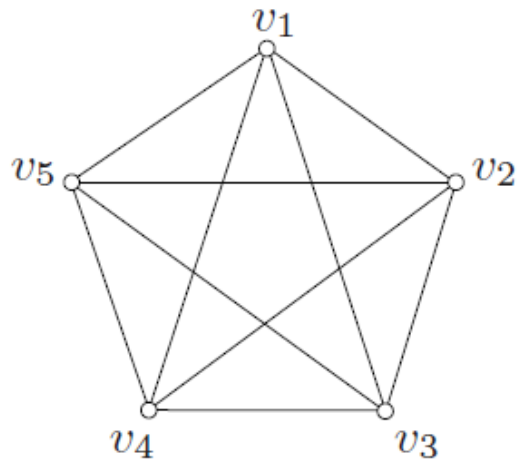


(d)



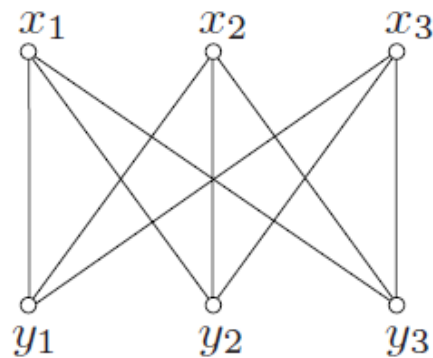
(e)

- Exemplos: Grafos não-planares



(a)

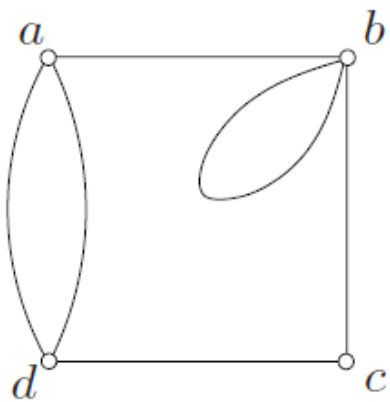
K_5



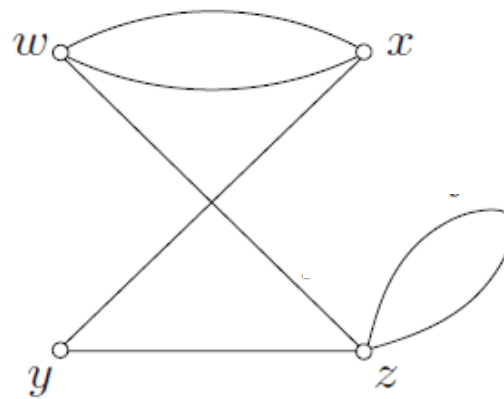
(b)

$K_{3,3}$

- Dados os grafos G e H , eles são **isomórficos** se existir uma correspondência entre os seus vértices.

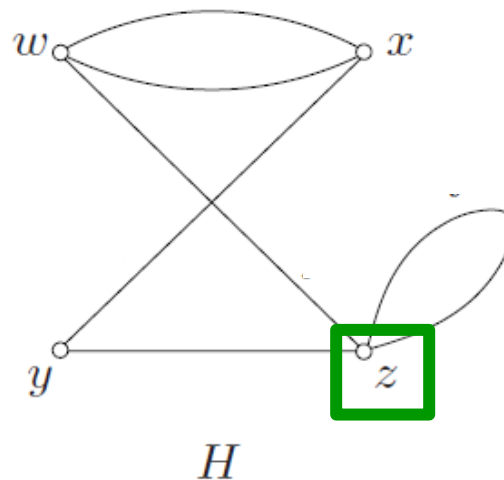
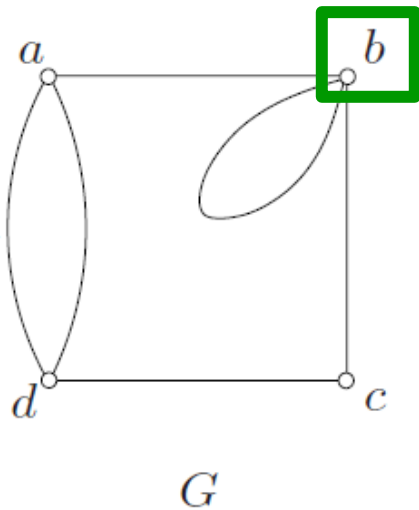


G

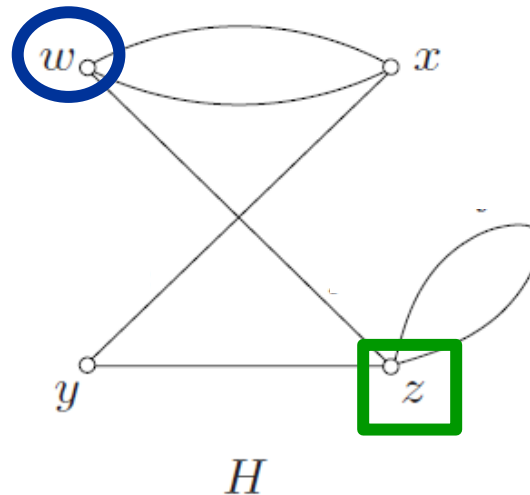
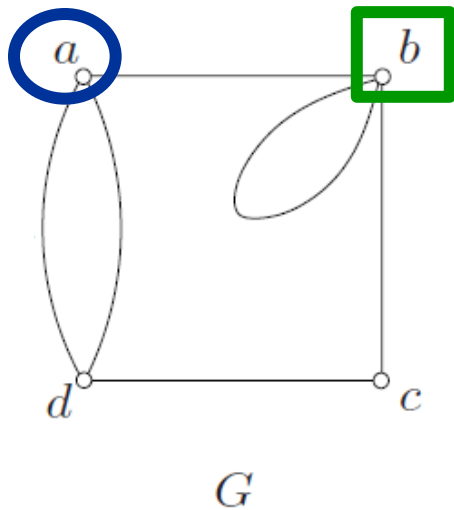


H

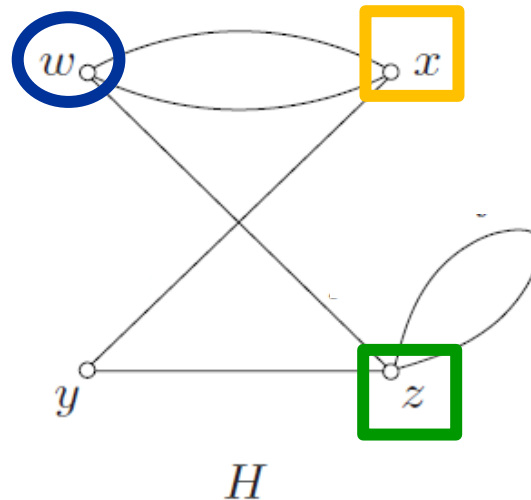
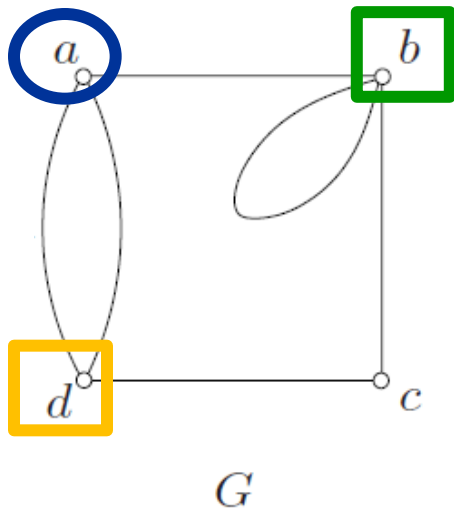
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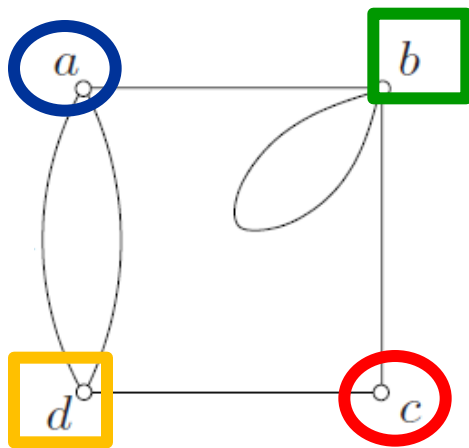
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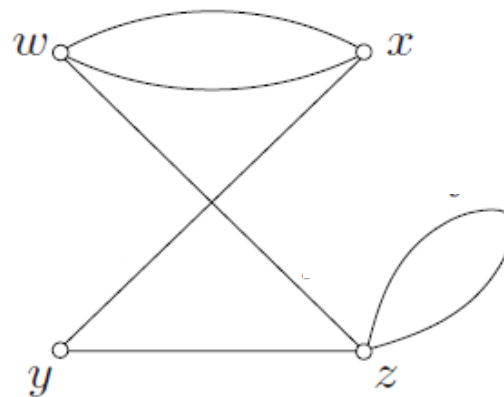
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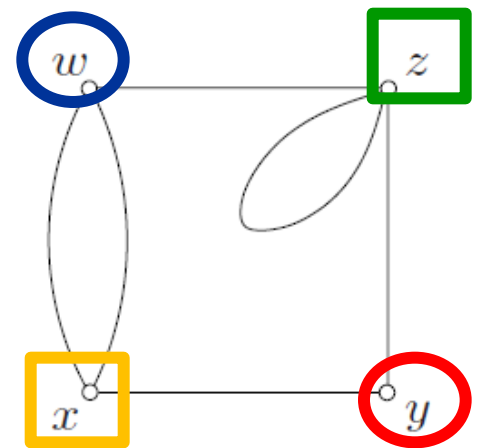
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G



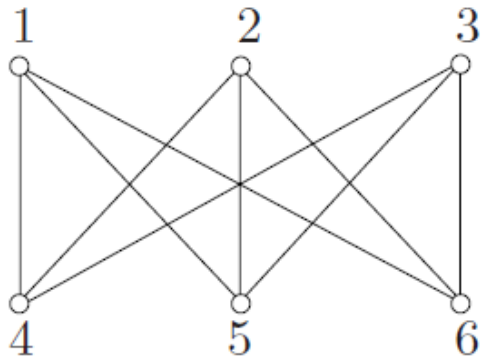
H



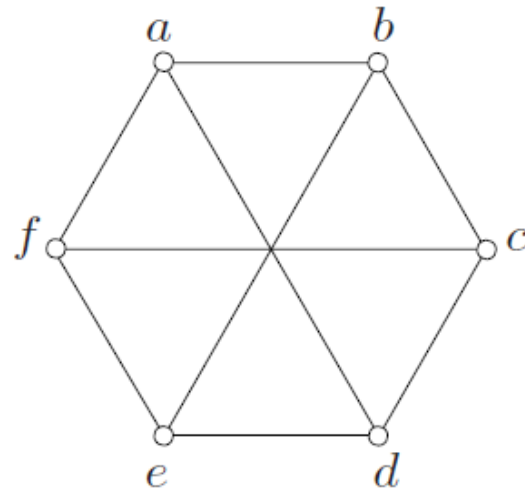
H

Exemplo 1

- Os seguintes grafos são **isomórficos**?



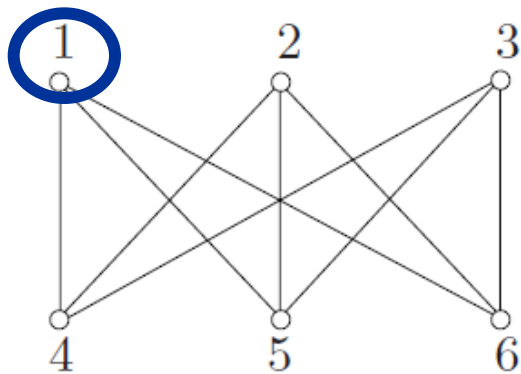
G



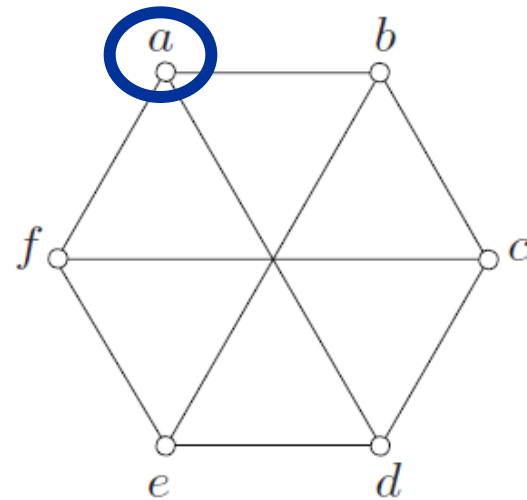
H

Exemplo 1

- Os seguintes grafos são **isomórficos**?



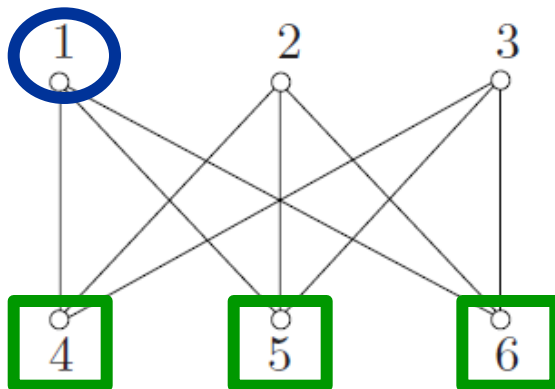
G



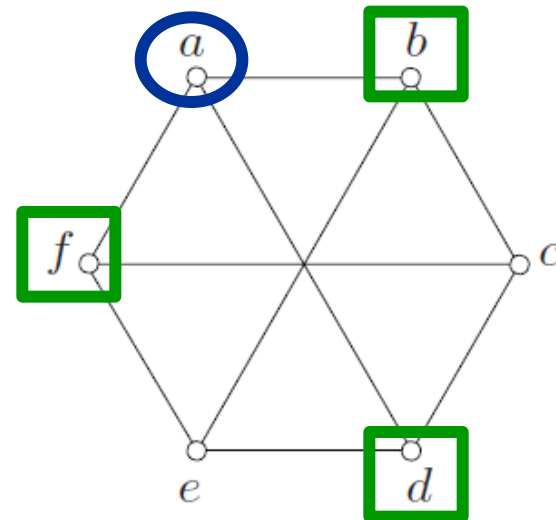
H

Exemplo 1

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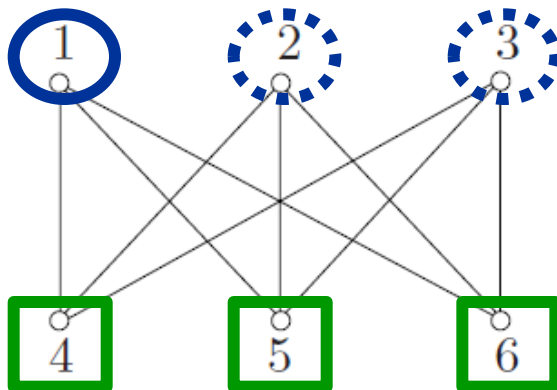
G



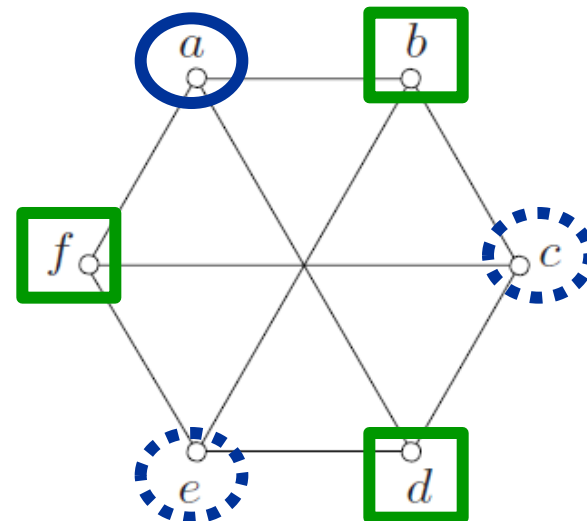
H

Exemplo 1

– Os seguintes grafos são **isomórficos**? **SIM.**



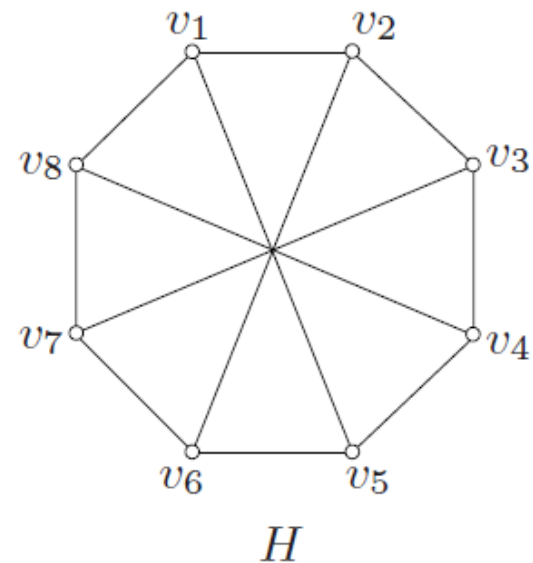
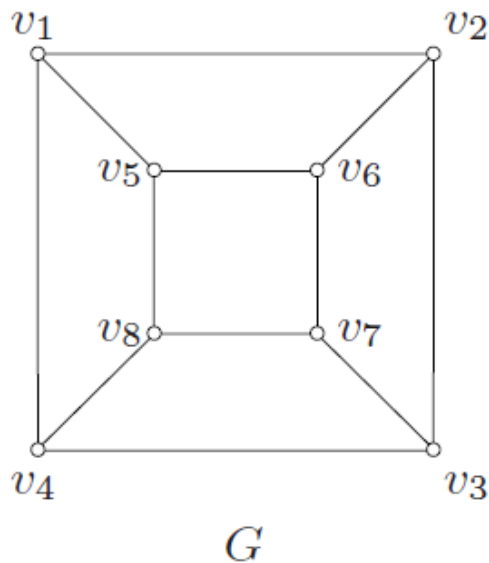
G



H

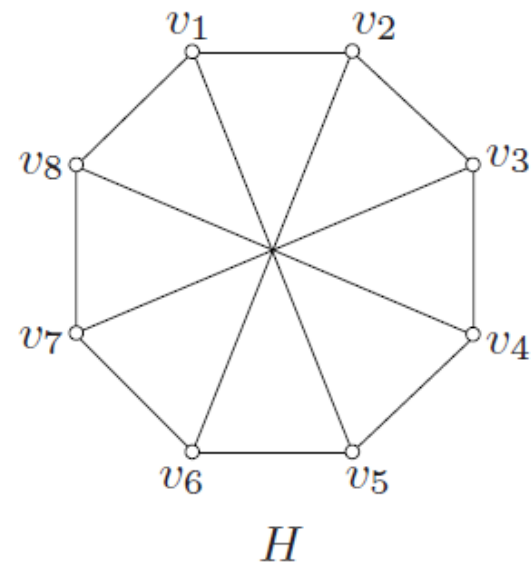
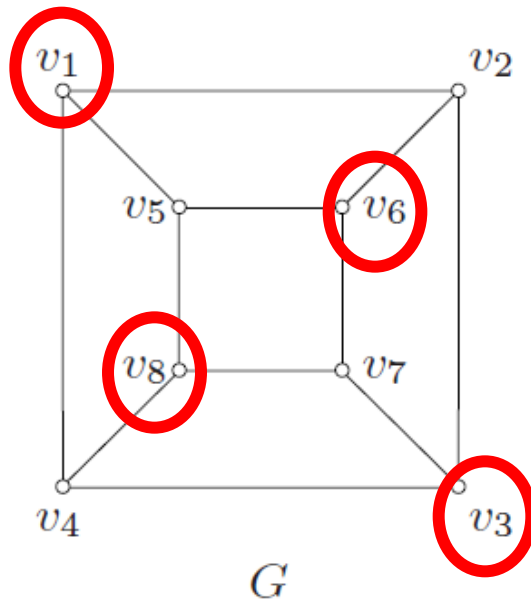
Exemplo 2

– Os seguintes grafos são **isomórficos**?



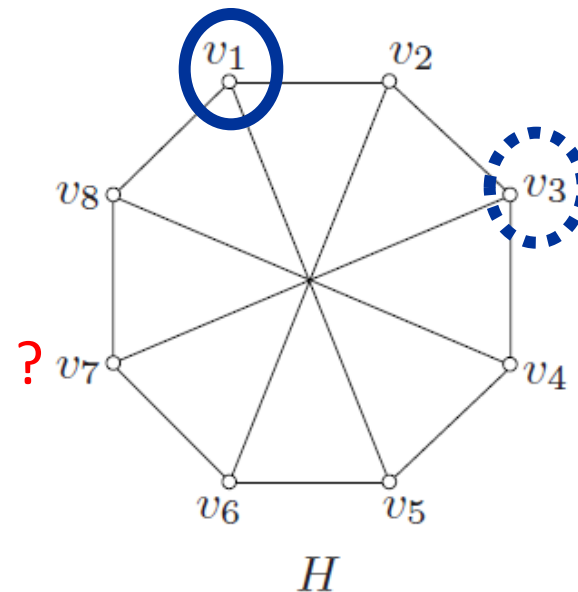
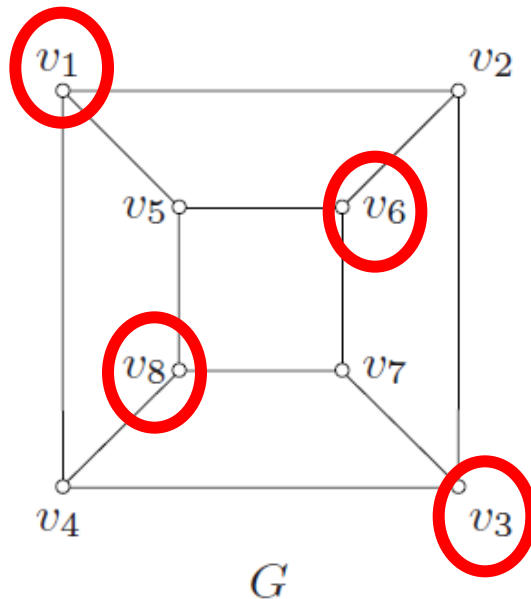
Exemplo 2

– Os seguintes grafos são **isomórficos**?



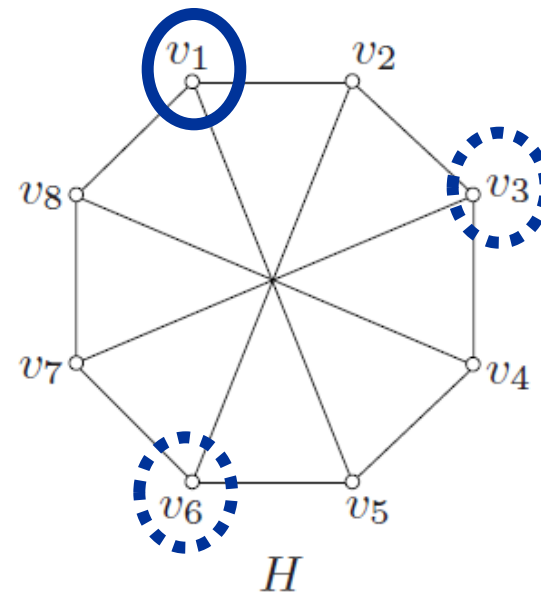
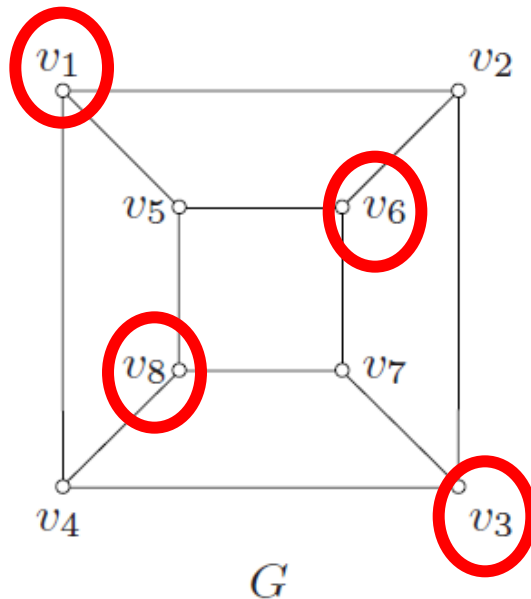
Exemplo 2

– Os seguintes grafos são **isomórficos**?



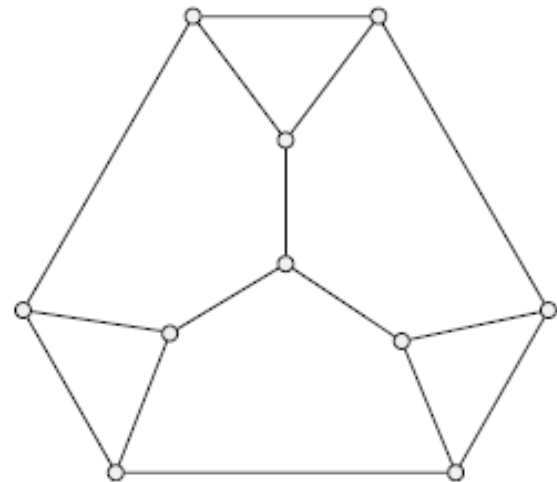
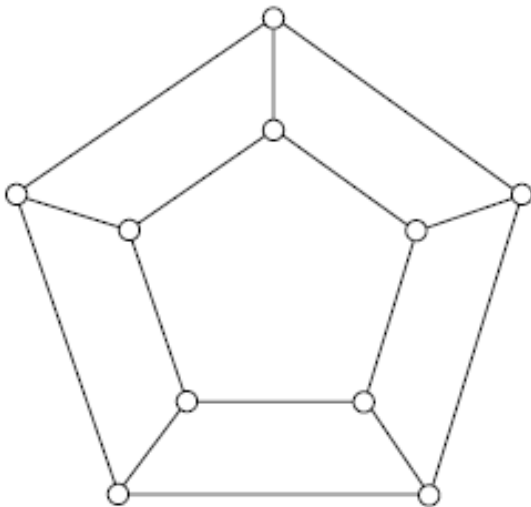
Exemplo 2

– Os seguintes grafos são **isomórficos**? **NÃO.** 



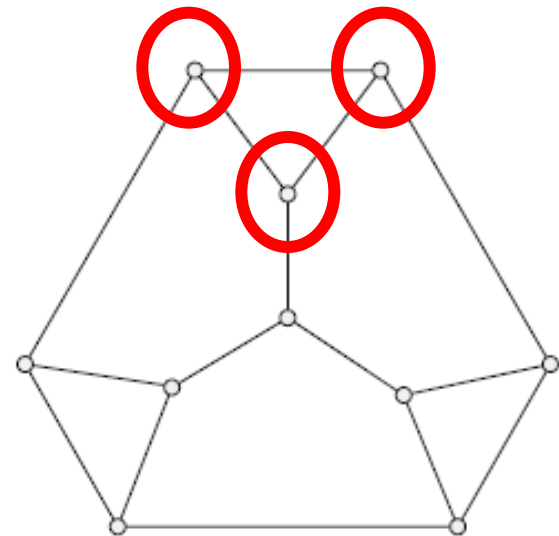
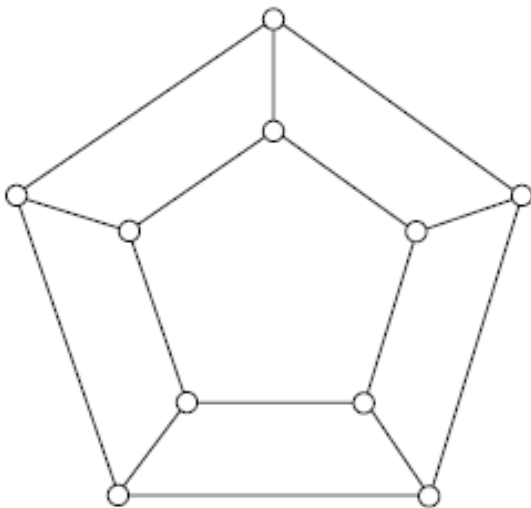
Exemplo 3

– Por que os seguintes grafos **não** são **isomórficos**?



Exemplo 3

– Por que os seguintes grafos **não** são **isomórficos**?



Revisão

- complemento?
- planaridade?
- isomorfismo?