



UNIVERSIDADE  
FEDERAL DO CEARÁ

CAMPUS DE RUSSAS

# *Algoritmos em Grafos*

Aula 09: Busca em Profundidade(Nomenclatura)

***Professor Pablo Soares***

***2022.1***

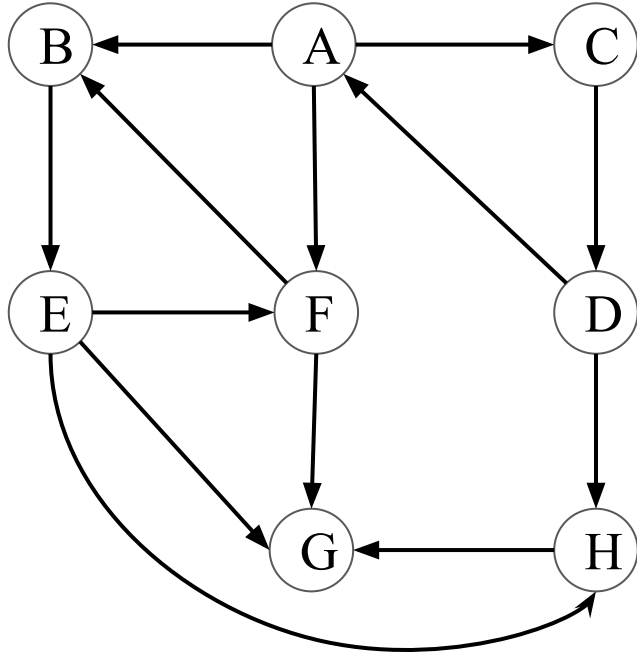
# Sumário

1. Busca em Profundidade(**última aula**);
  - a. Tempo de chegada e tempo de saída;
  - b. Marcação de cores.
2. Nomenclatura das arestas após uma busca em profundidade;
  - a. Verificação de ciclos no grafo.
3. Ordenação Topológica;
4. Componentes Conexas.

# Nomenclatura das arestas em DFS

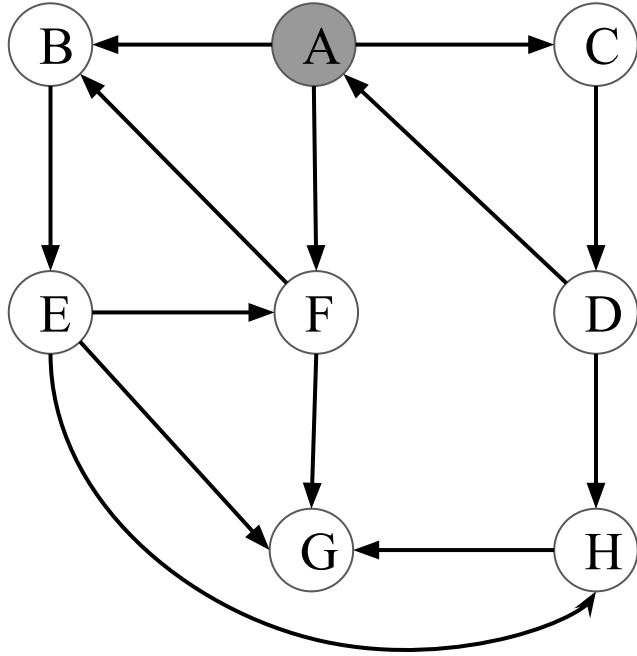
- Aresta de Árvore: A aresta  $(u, v)$  é uma aresta de **árvore** se  $v$  foi descoberto pela primeira vez ao percorrer a aresta  $(u, v)$ ;
- Aresta de Retorno: Conecta um vértice  $u$  com o antecessor  $v$  na **árvore de busca**;
  - Ex: aresta tipo laço.
- Aresta de Avanço: Conecta um vértice a um descendente que pertence a **árvore de busca**;
- Aresta de Cruzamento: Conecta um vértice  $u$  a um vértice  $v$  que já teve todos os seus vizinhos explorados.

# Nomenclatura das arestas



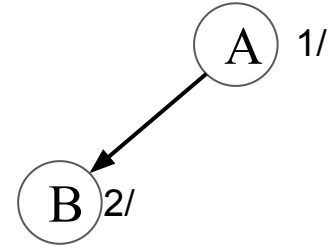
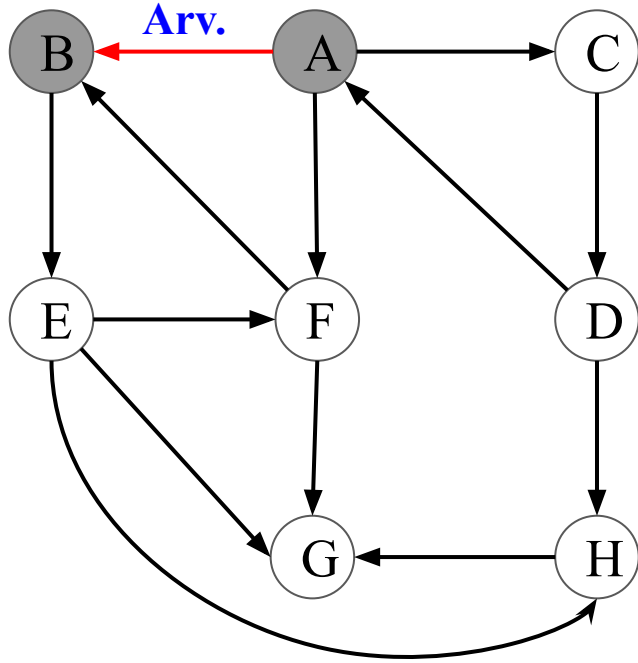
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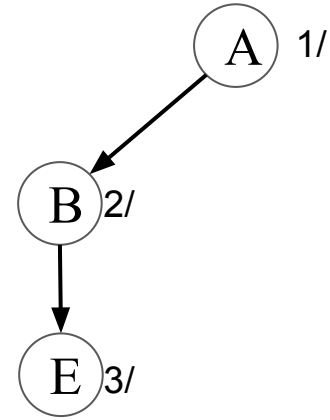
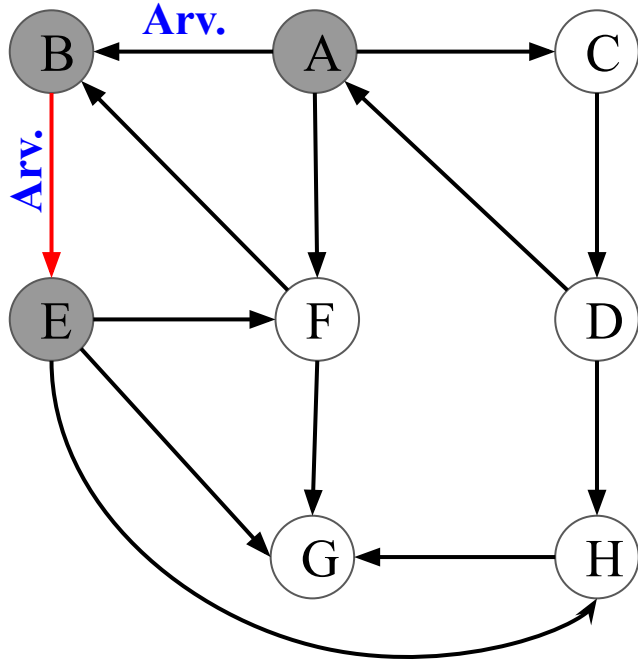
Árvore de Busca

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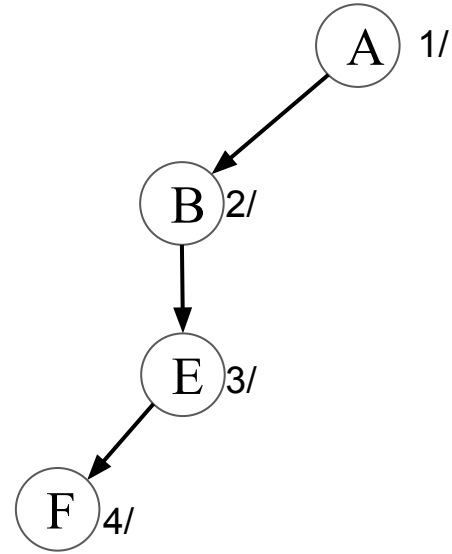
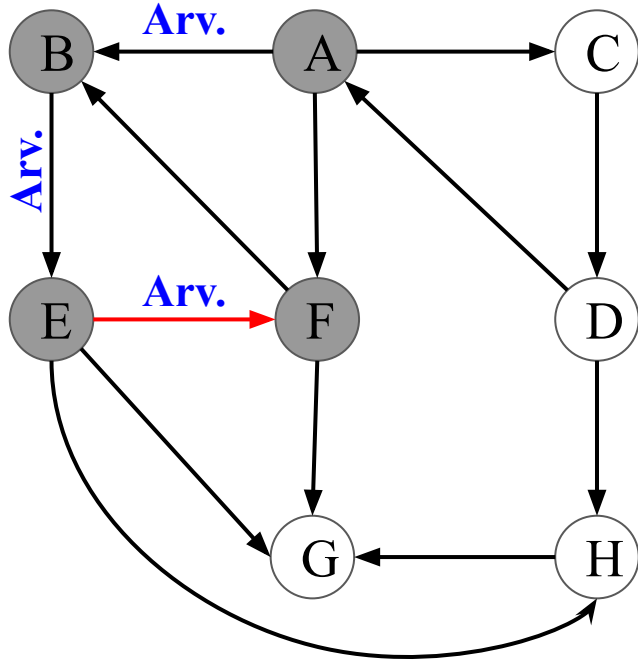
Árvore de Busca

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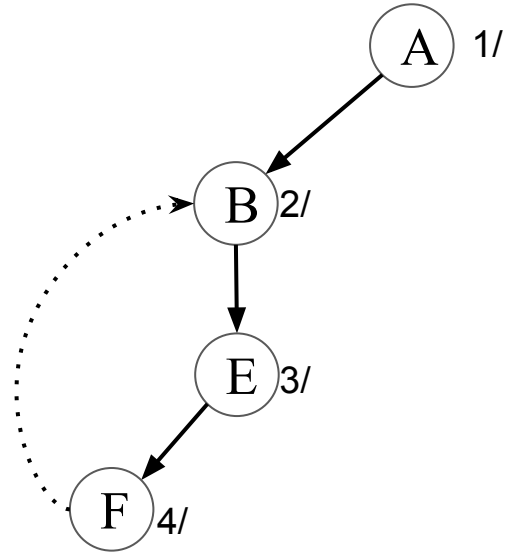
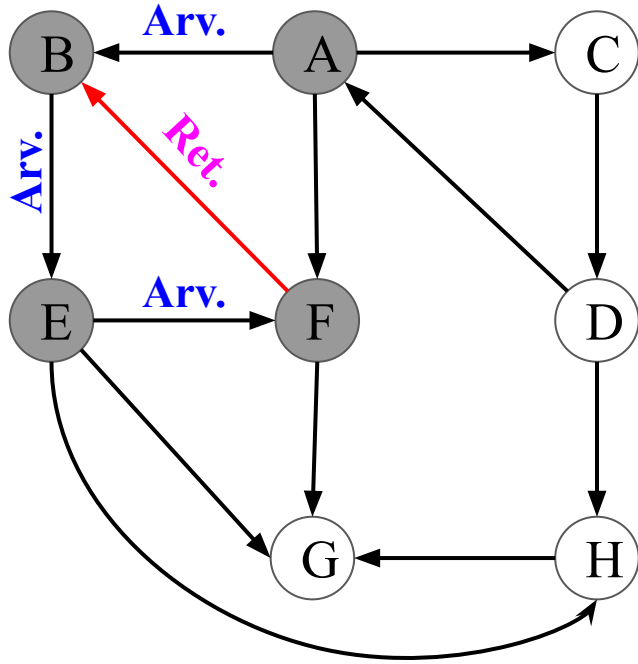
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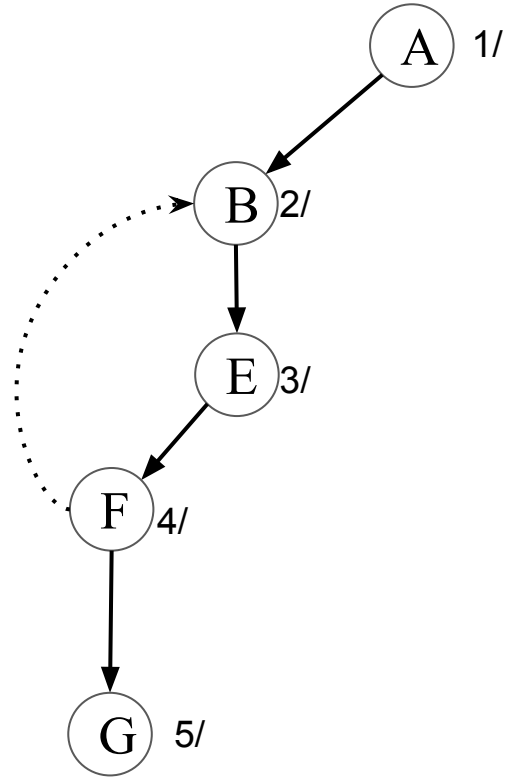
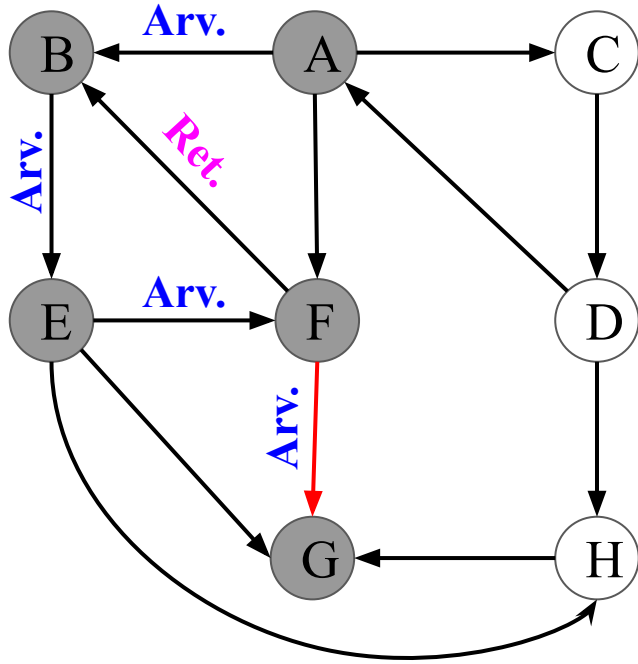


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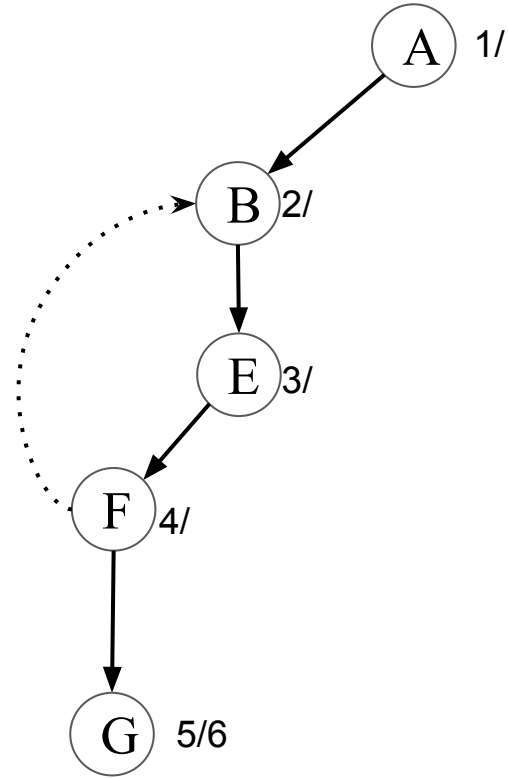
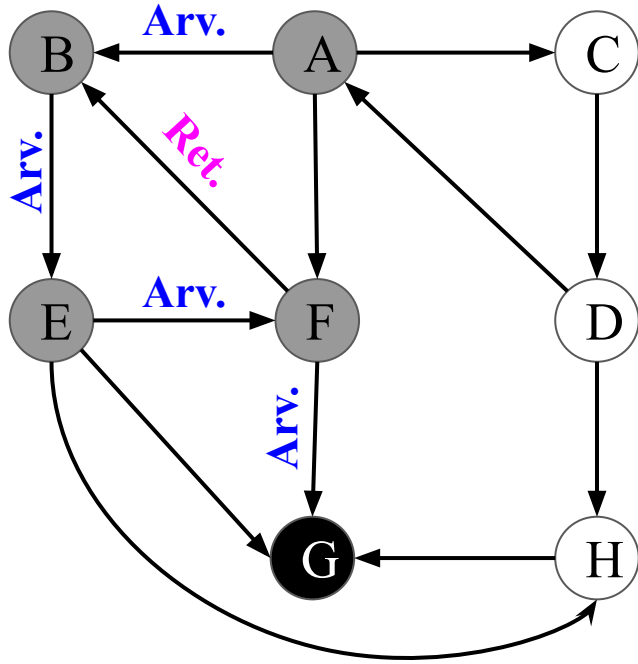
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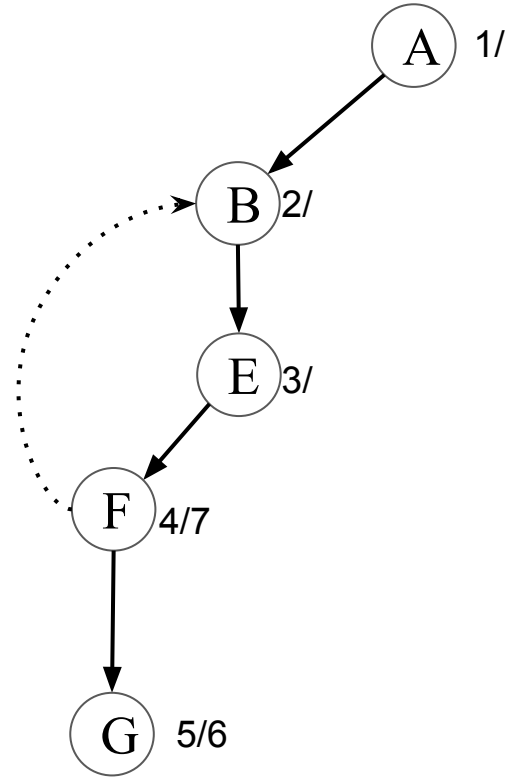
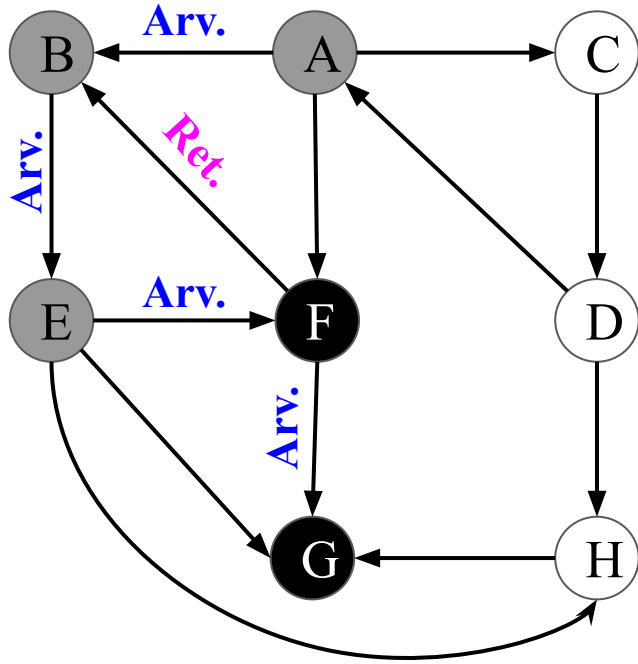
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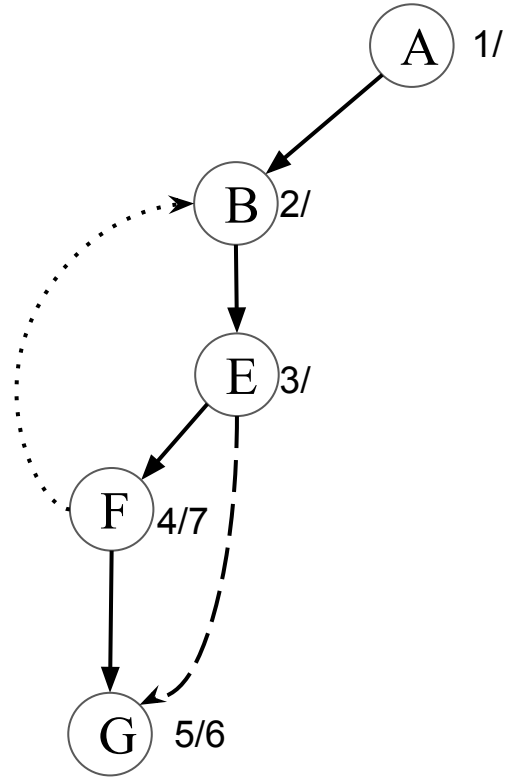
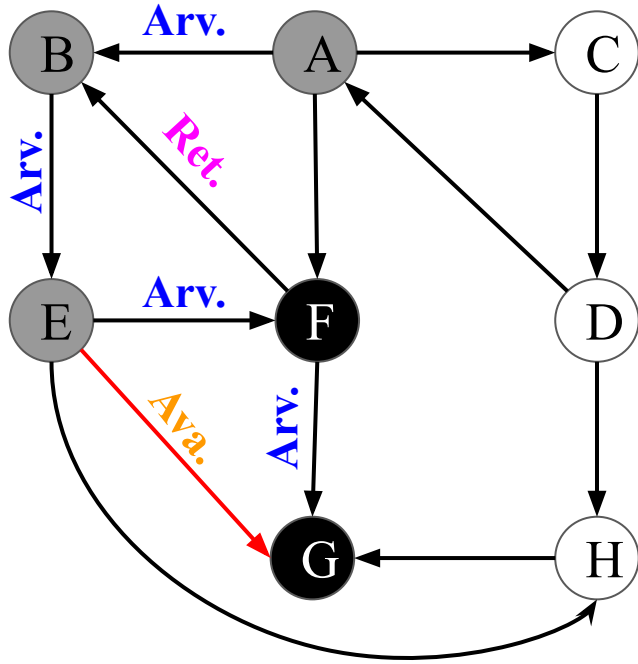
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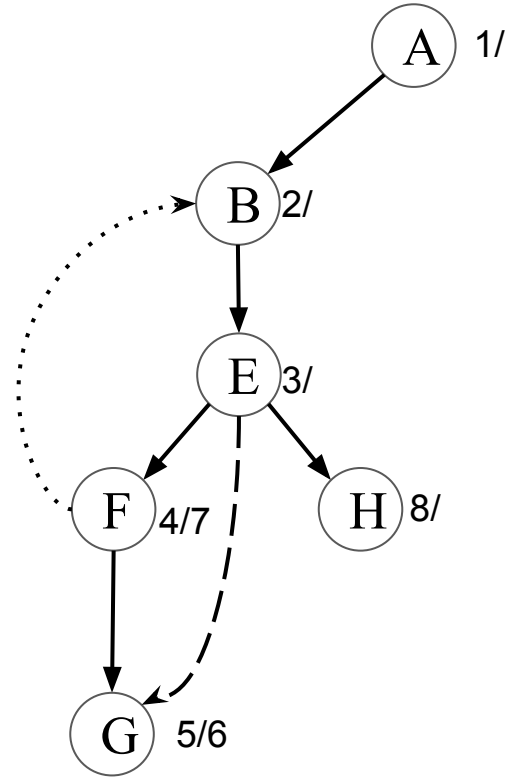
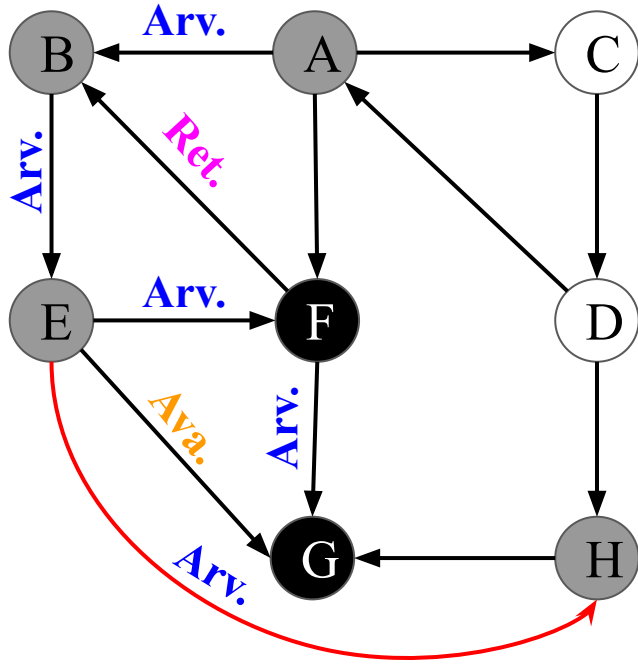
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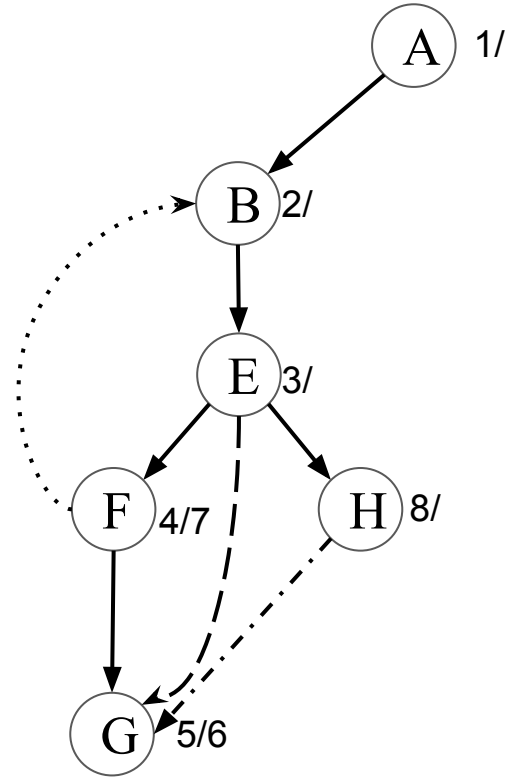
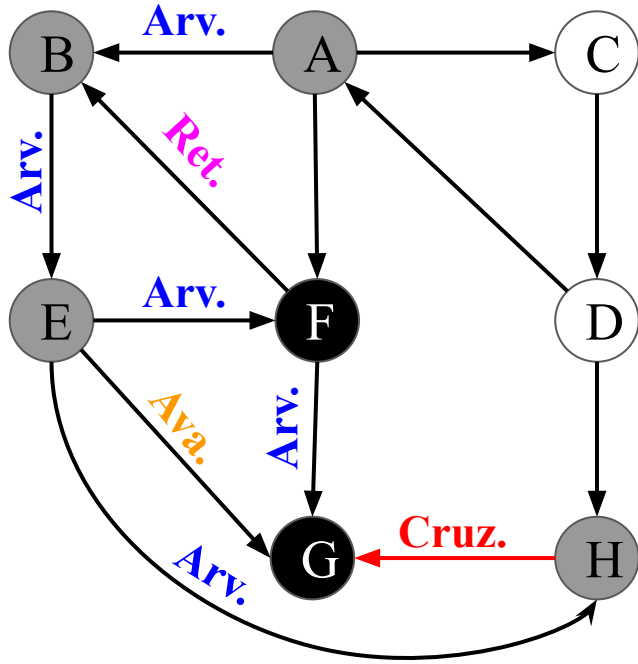
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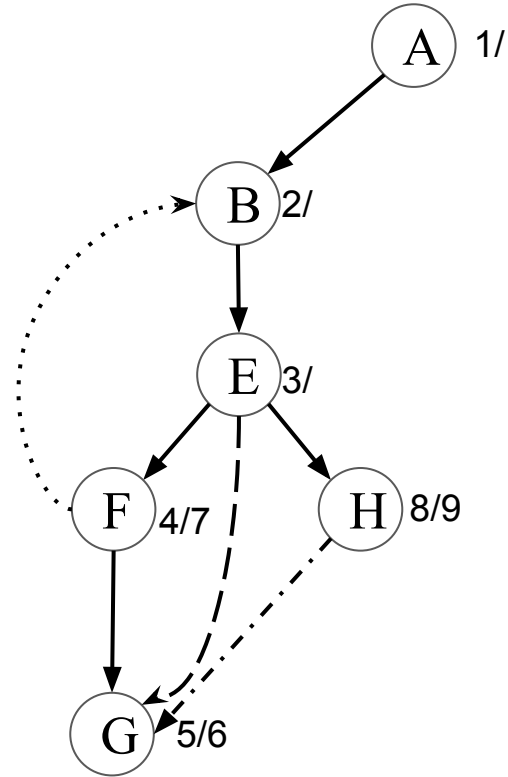
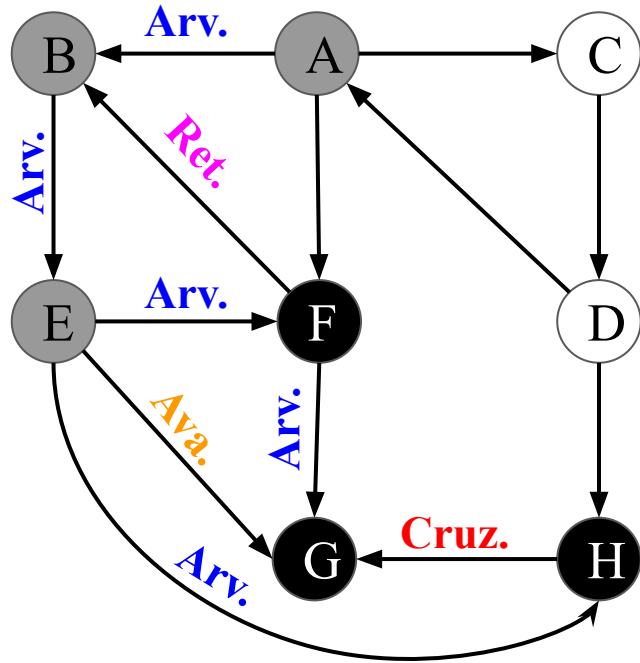
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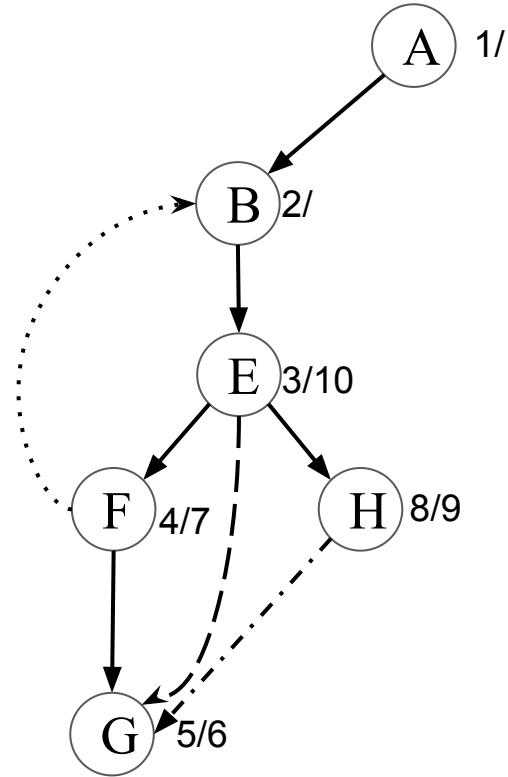
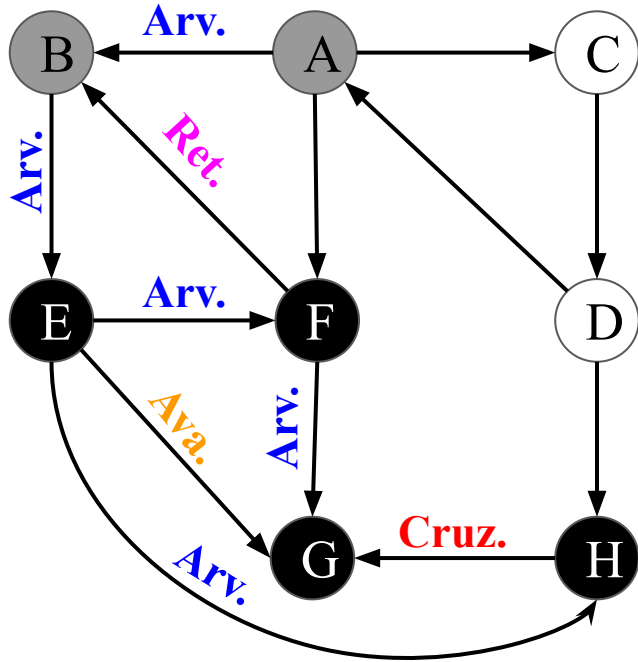
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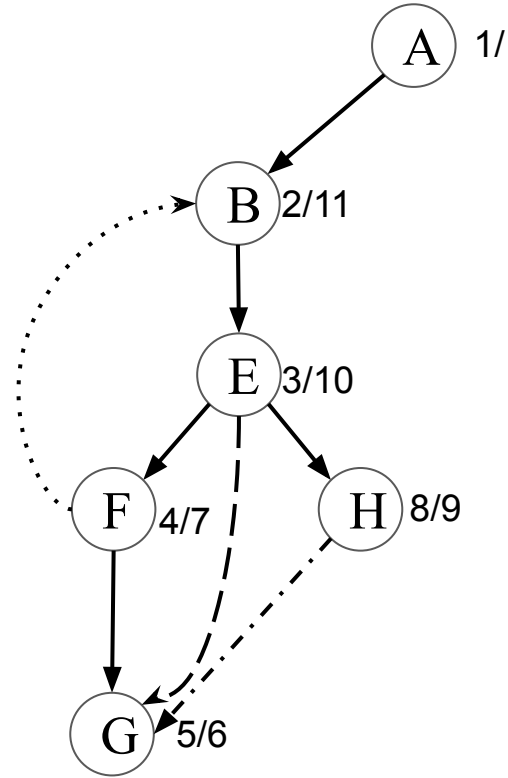
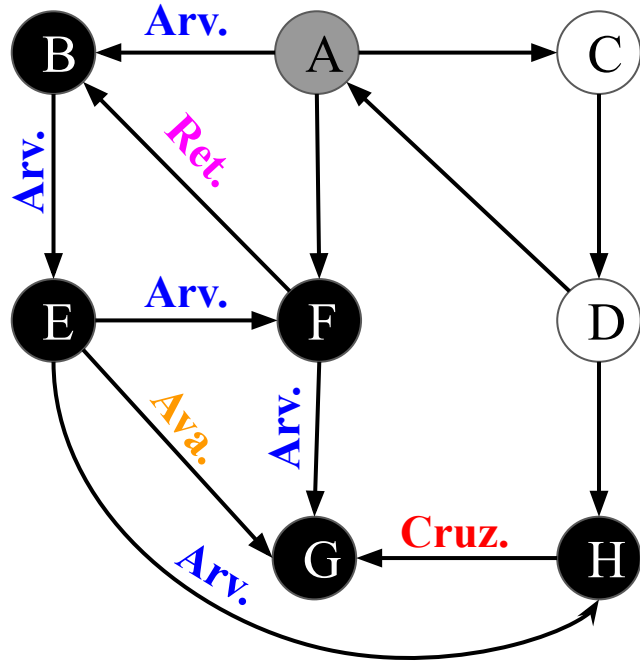


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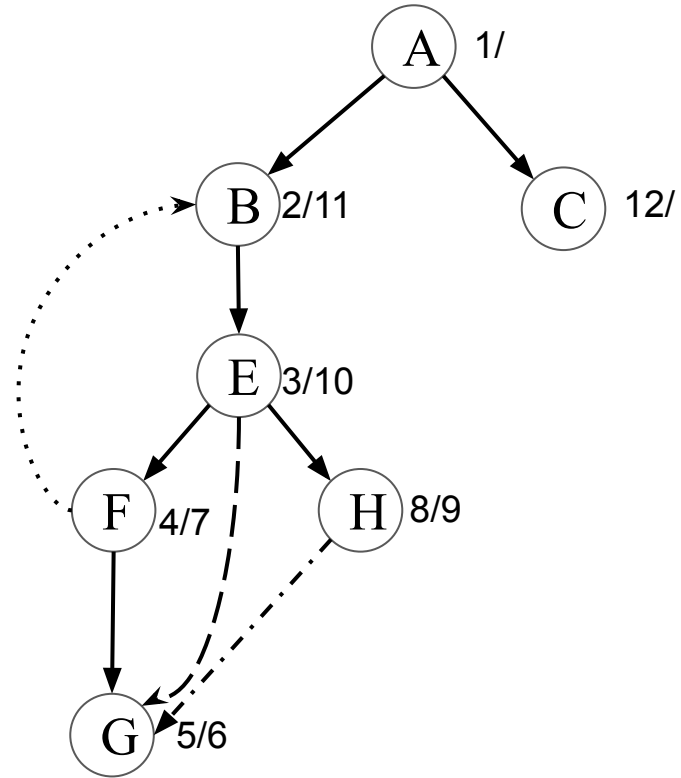
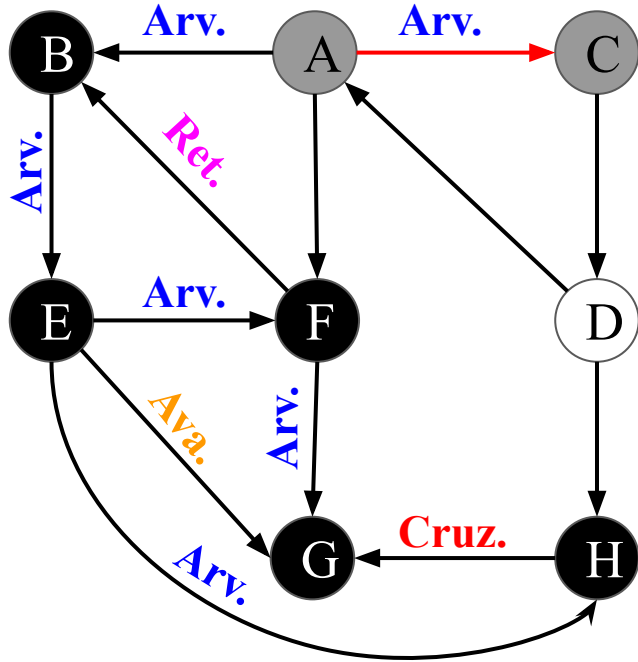
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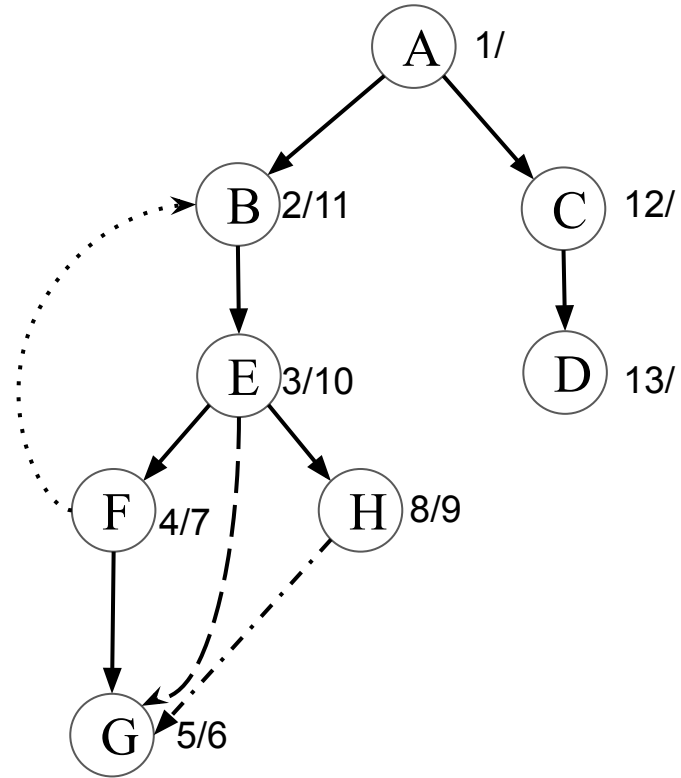
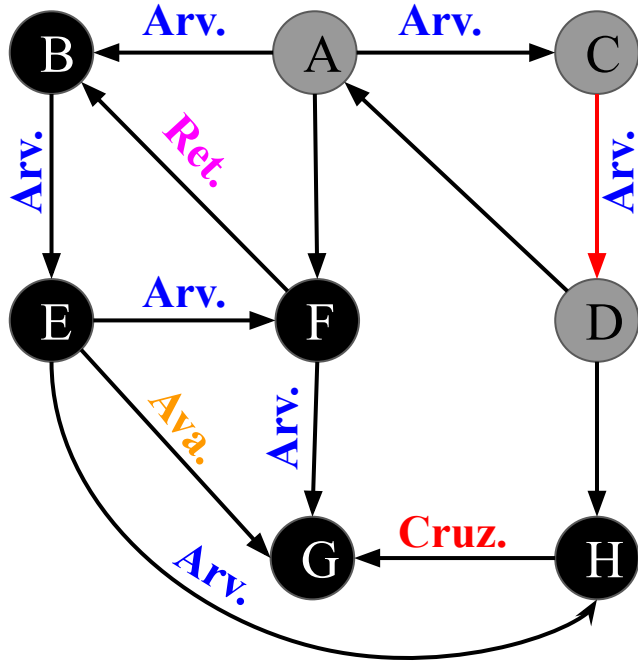
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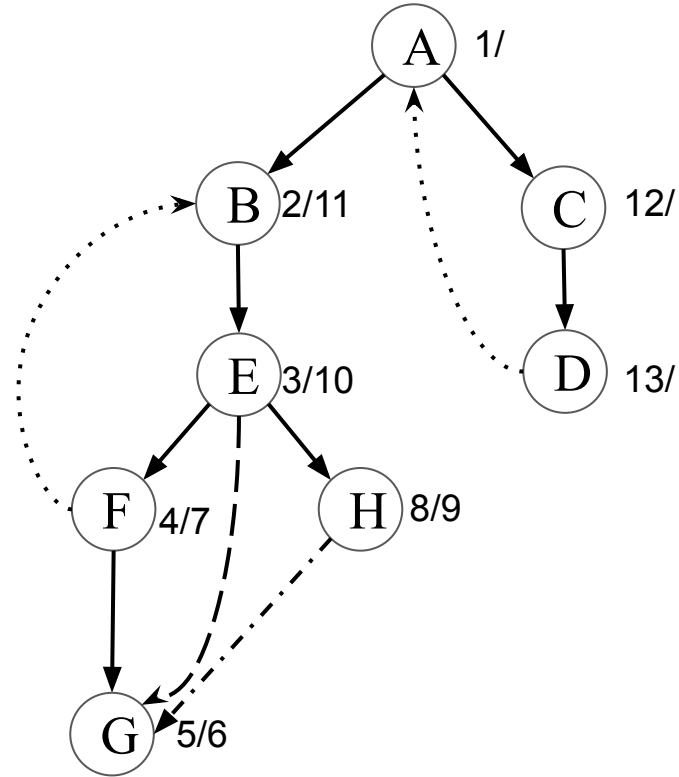
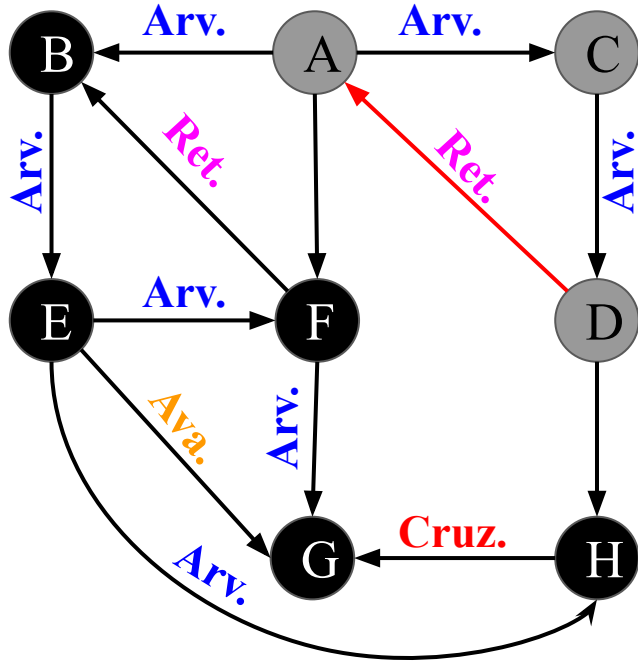
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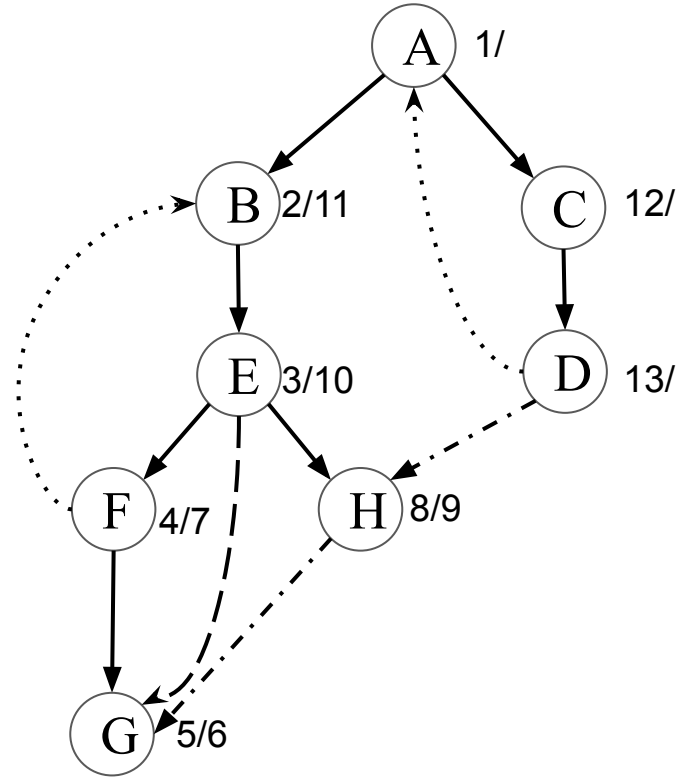
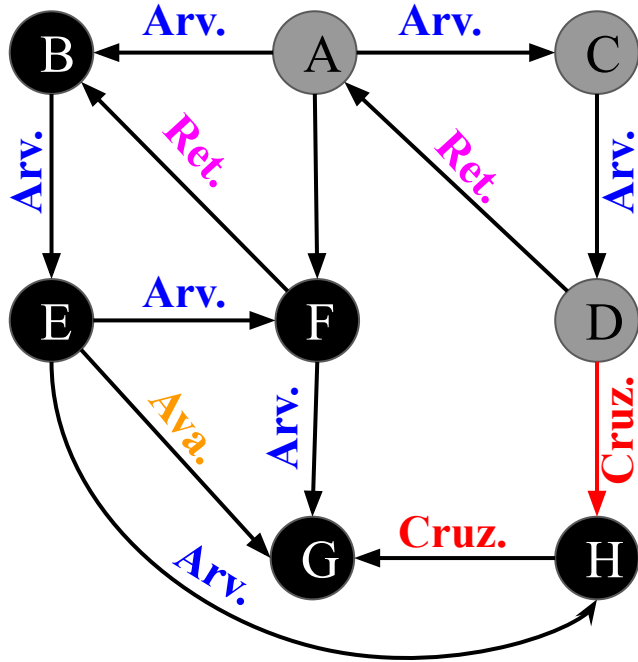
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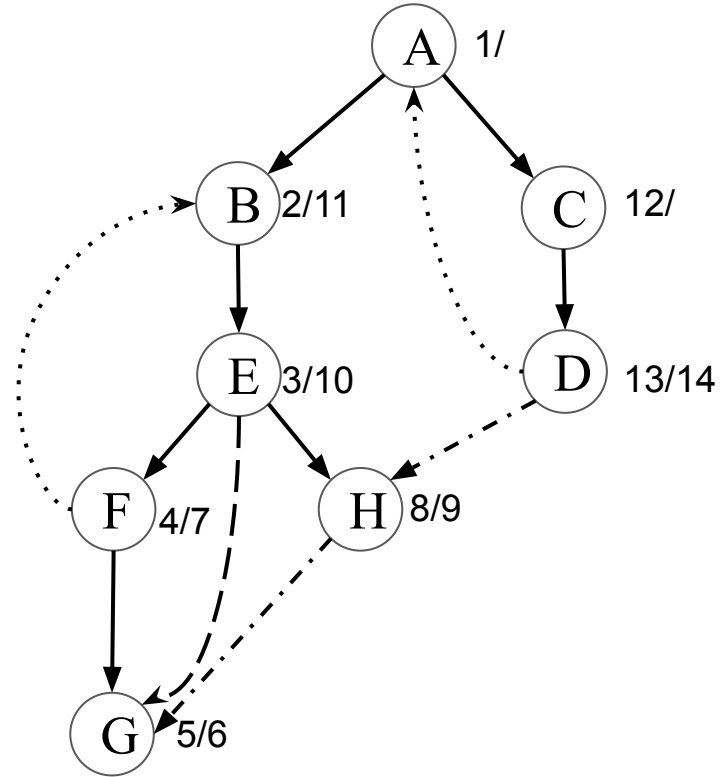
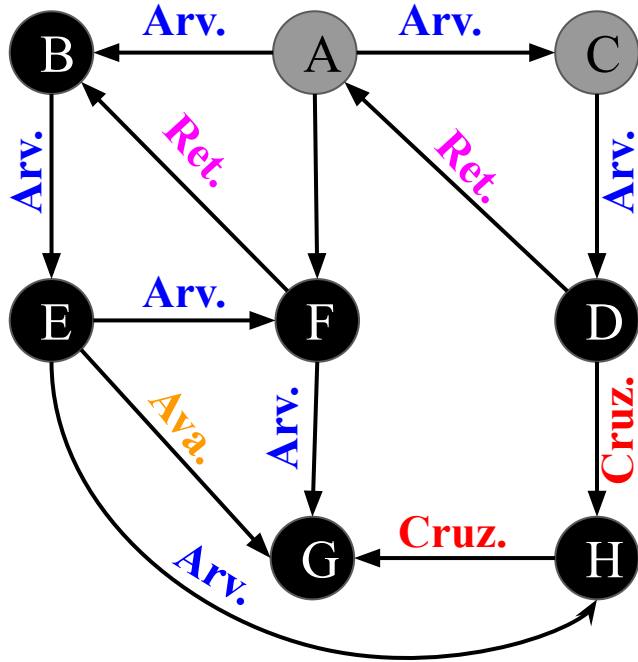
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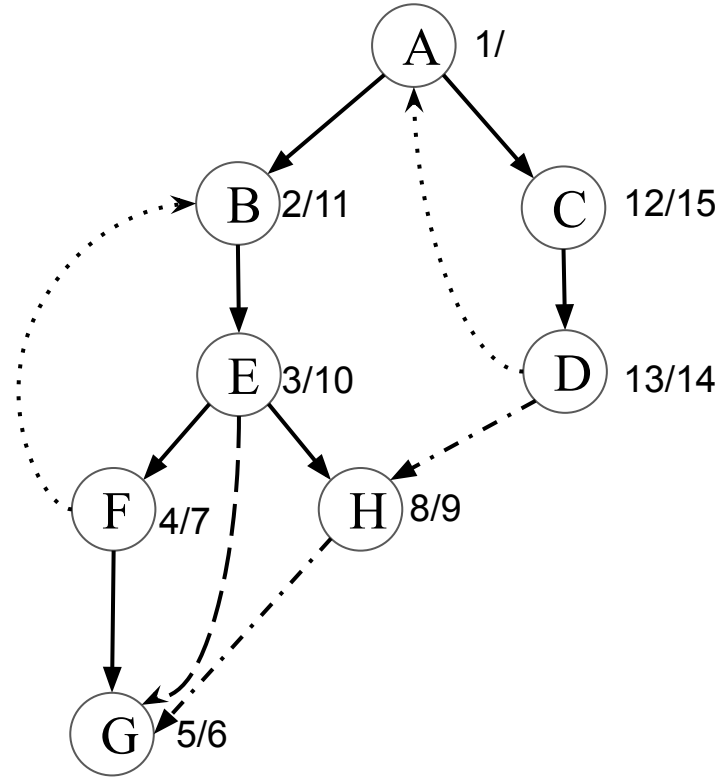
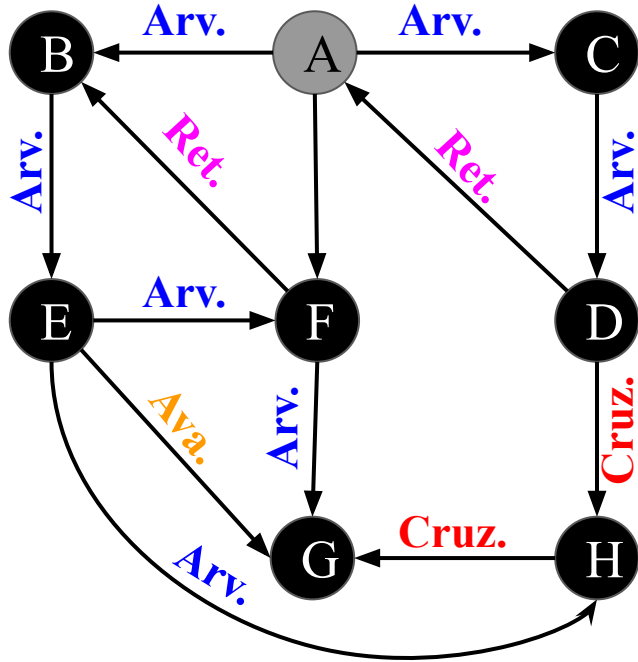
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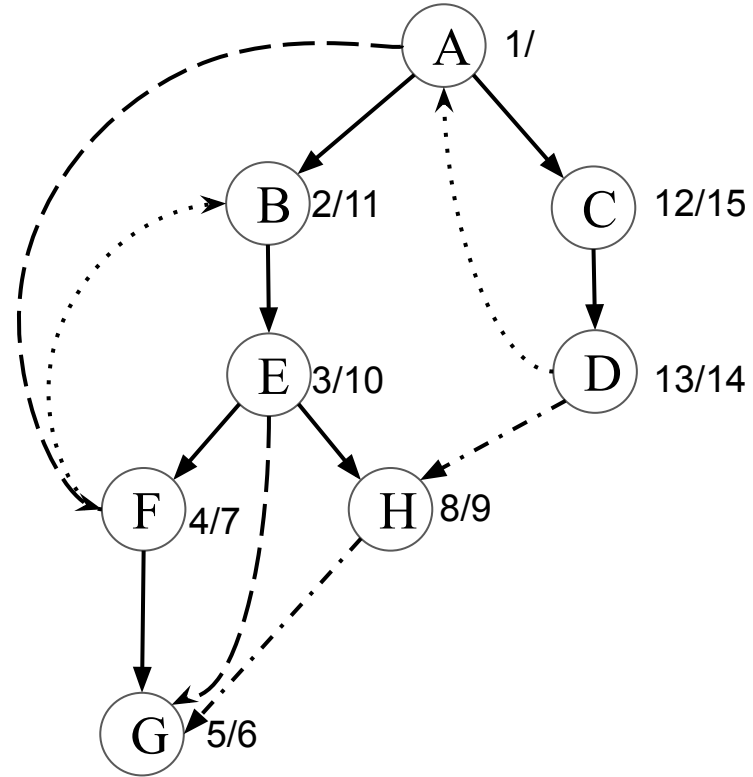
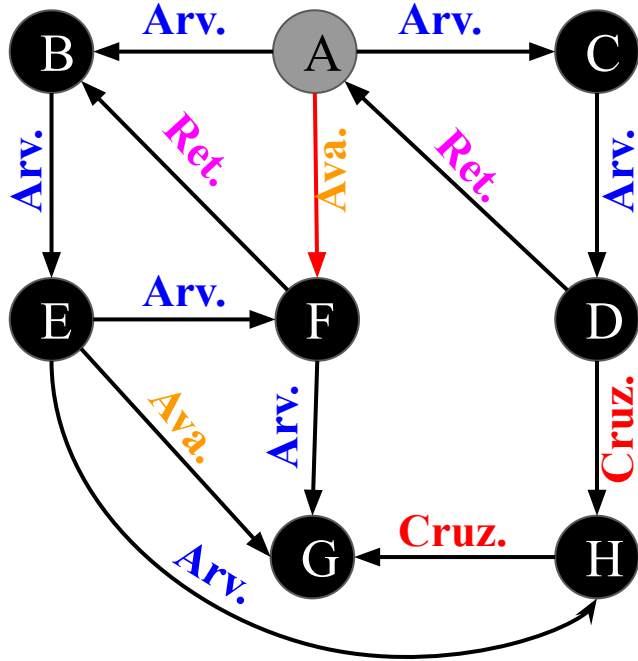
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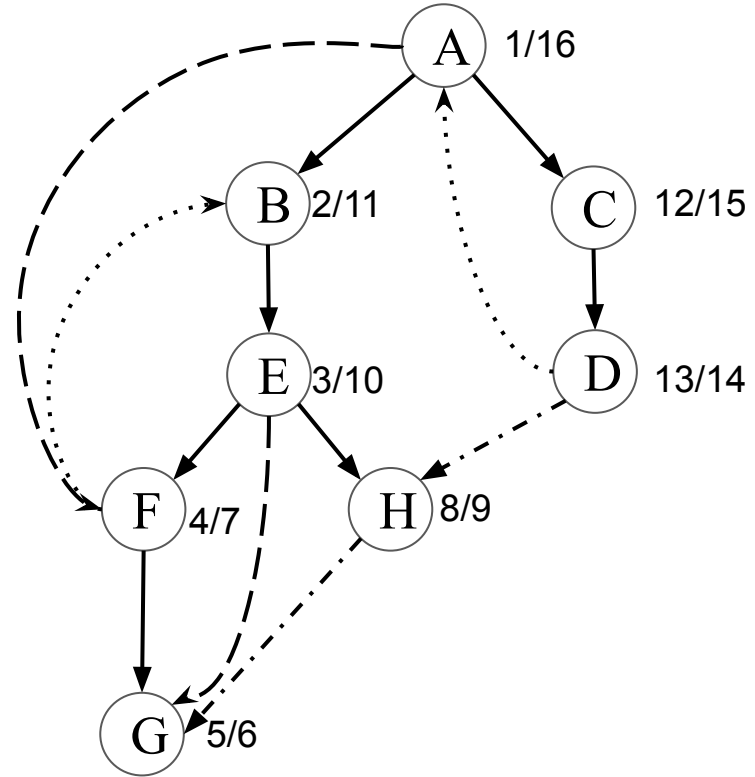
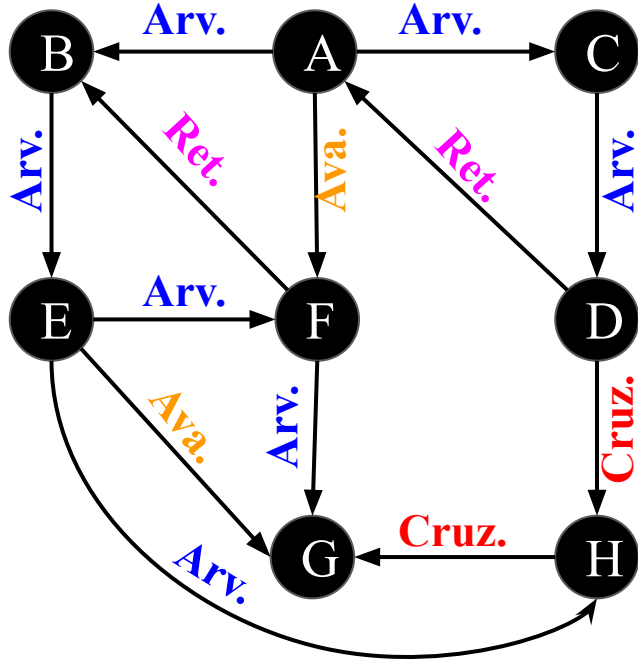


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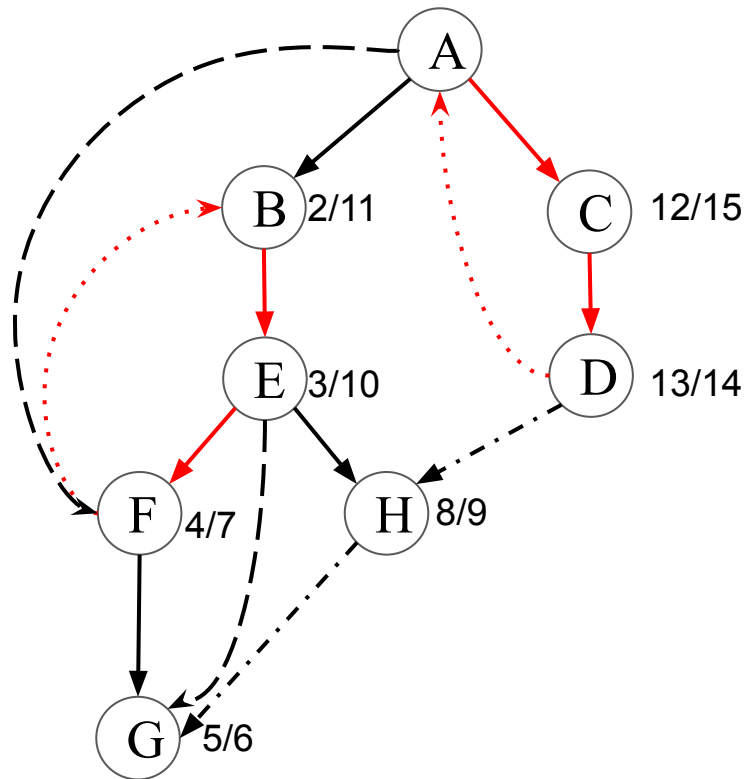
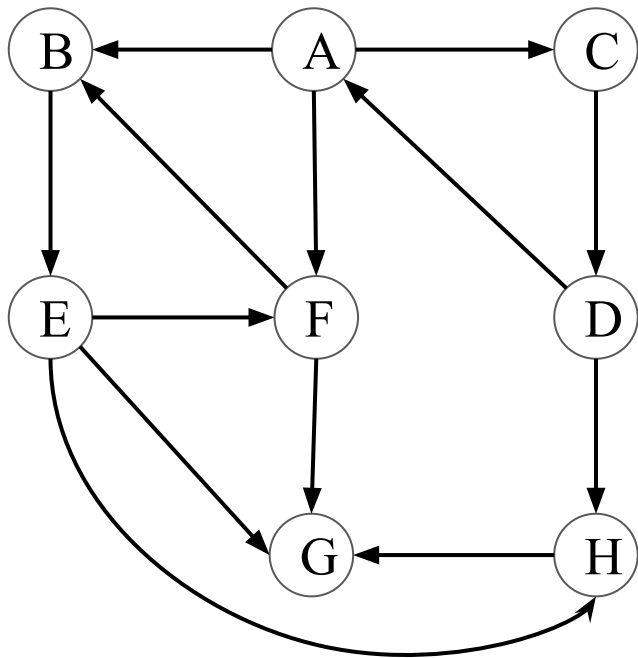
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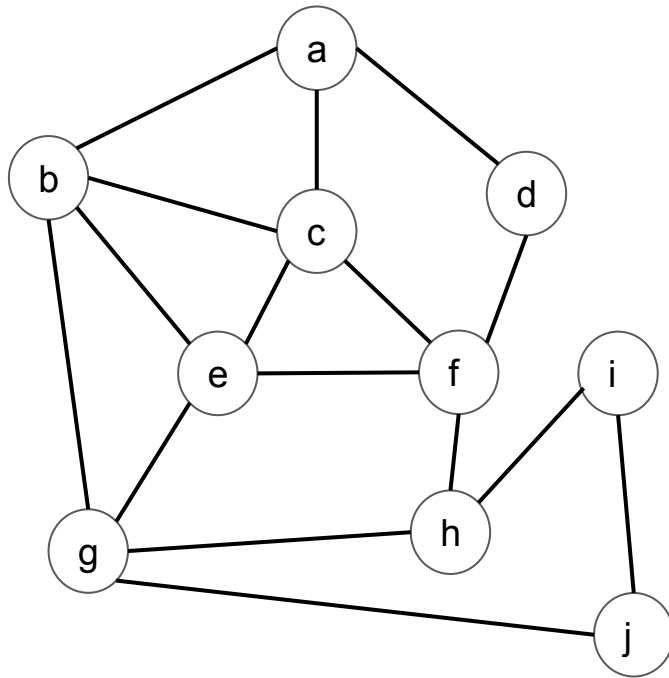
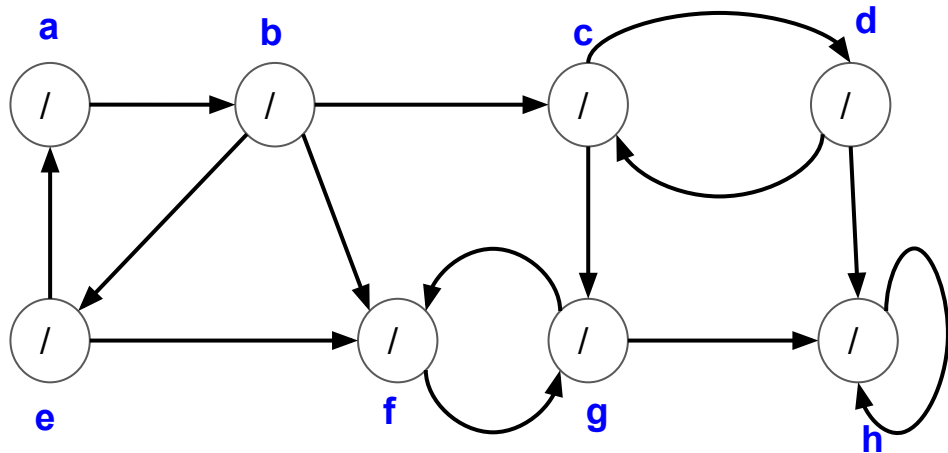
# Identificação de Ciclo no Grafo

- Ao executar *DFS*, se encontrar uma aresta de retorno.
  - Então o grafo tem ciclo



# Exercício de fixação

1-Executa DFS em cada um dos grafos a seguir. Comece a busca pelo vértice “c” em cada grafo. Apresenta a **árvore gerada** e o nome das arestas, assim como, os vetores “d” e “f”.





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