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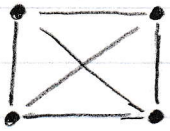
CIS 575 Homework 5 3.05.19

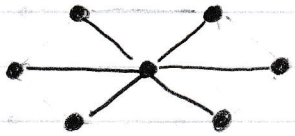
1. 1. Draw or describe

a.

b.



c.



2. For 'n' nodes:

a. at most n-1 edges.

b. at least n-1 edges, and $\frac{n \times (n-1)}{2}$.

c. exactly n-1 edges.

2 1. G is an adjacency matrix:

$$\sum_{i=1}^{n} \left(\Theta(n) \right) + \sum_{i=1}^{n} a_i \rightarrow \Theta(n^2) + \cancel{\Theta(a)}$$

$$\boxed{\Theta(n^2)}$$

2. G is an adjacency list:

$$\sum_{i=1}^{n} \left(\Theta(1) + a_i \right) \rightarrow \sum_{i=1}^{n} \Theta(1) + \sum_{i=1}^{n} a_i \Rightarrow \Theta(n) + \Theta(a)$$

$$\Theta(n+a)$$

$$\boxed{\Theta(n+a)}$$

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[3] 1. Write an algorithm to build $G' = (\{1 \dots n\}, E')$ from $G = (\{1 \dots n\}, E)$ where $E' = \{e \in E \mid w(e) > 7\}$.

- Assume that G' is initially $(\{1 \dots n\}, \emptyset)$

- Algorithm

```
for i ← 1 to n
    edges ← G.AllFrom(i)
    foreach e ∈ edges
        if w(e) > 7
            G'.Put(s(e), t(e), w(e))
```

(s(e), t(e), w(e)): source, target, data/weight

2. Assume adjacency list representation, what is the run-time as a function of n and a (recall that $a = |E|$).

$$\sum_{i=1}^{n} (\Theta(1) + a_i) \rightarrow \sum_{i=1}^{n} \Theta(1) + \sum_{i=1}^{n} a_i$$

$\Theta(1)$: adjacency lists, "ALL FROM"

$$\Theta(n) + \Theta(a) \leftarrow \Theta(n + a)$$

Our algorithm should run in $\Theta(n + a)$