HW #3 ① a directed graph

Boolean circuit 을 사용하면 가능 > TM 보다 효과적

→ 순환불가능.

a directed acyclic graph

Nodes — gates : $\vee$, $\wedge$, ~

- input nodes : in-degree = 0
  - Boolean variables X
  - (~)X negation
  - 0, 1

a boolean function

$$\{0,1\}^n \rightarrow \{0,1\}$$

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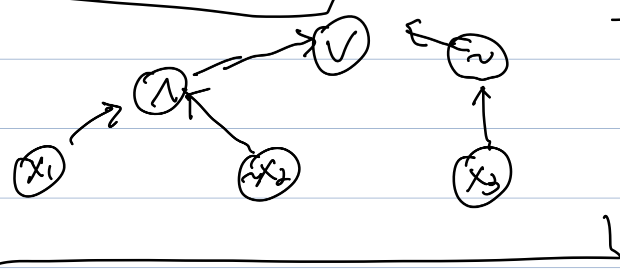
n = 3개라고 하면 0과 1중 아무거나 3개 뽑는거.



→ General directed graph

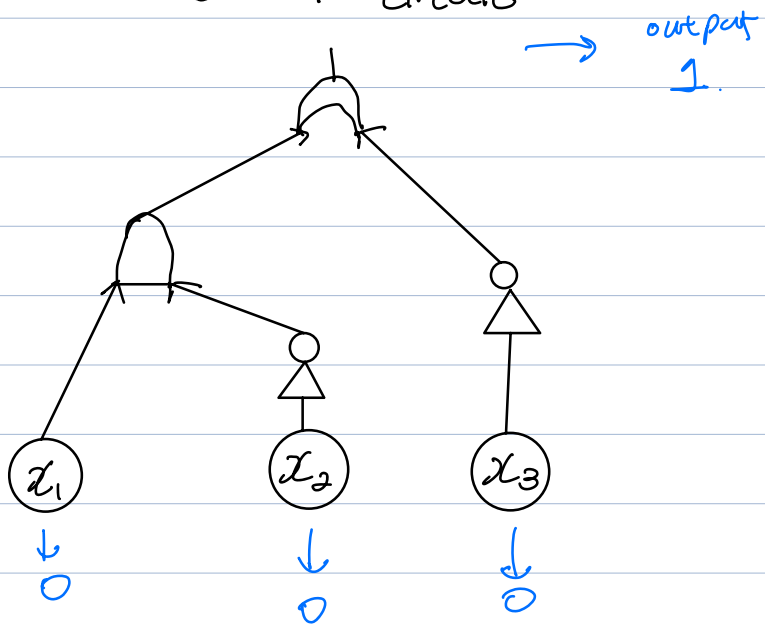
Boolean function

Boolean function

$$f \quad (x_1 \wedge \sim x_2) \vee (\sim x_3)$$

그래프 어떻게

Boolean circuit



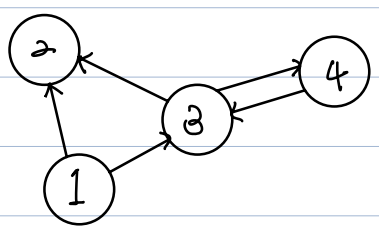
An acyclic directed graph G can compute the value of a boolean function if

(1) nodes that do not have any incoming edges represent either a boolean variable, the negation of a boolean variable, 0 or 1

(2) all other nodes represent either "and", "or", "negation"

boolean circuit problem.

Ex)



1. does not have any incoming nodes

1 = 0

2, 3, 4 are → "and", "or", "negation"

반례. $\lim_{n \to \infty} \frac{n^b}{a^n} = 0$

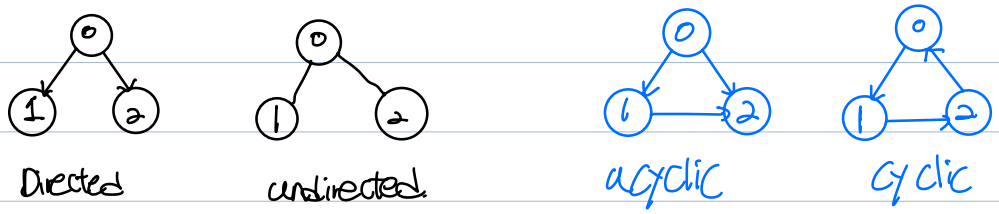
어떻게 도출되었나.

$n^b = o(a^n)$

problem Statement

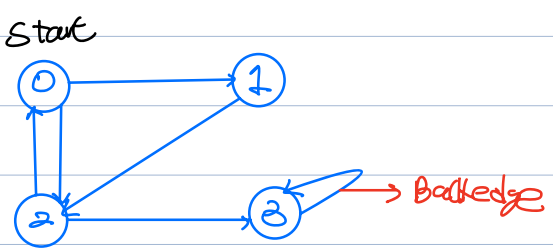
problem: Given a directed graph, check whether the graph contains a cycle or not.

keywords: directed graph, cycle



Approach

DFS solution



Backedge: an edge that is from a node to itself (self loop) or one of its ancestor