

# Math 322

Exam ch 11-12

12 probs @ 10pts  
110pts = 100%

## 11.1 Intro to Trees (2 probs)

① Prove. p. 754  $h \leq 5$

$M^h$   $M$ -ary tree of height  $h$ ,  $l \leq M^h$  ( $h=0,1,2,\dots$ )

pf (Induction)

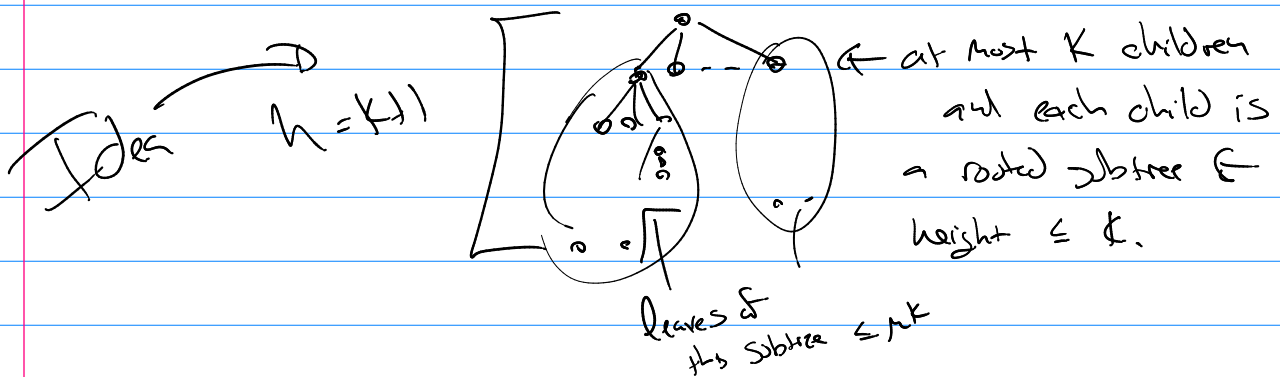
Basis  $M$ -ary tree of height  $h=0$

Inductive Step assume that

for a  $M$ -ary tree of height  $h=k$   $l \leq M^k$

Show for a  $M$ -ary tree of height  $h=k+1$  that  $l \leq M^{k+1}$

$l=1 \rightarrow l \leq M^0$   
 $M^0=1 \rightarrow 1 \leq 1$  True



② Word problem: chain text? chain letter? (similar)

use ①  $n = i + l$

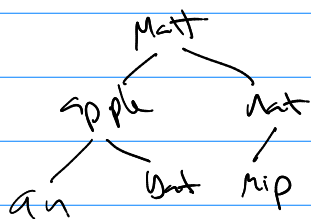
② full  $M$ -ary  $n = M^i + 1$

③  $l \leq M^h$  or  $h \geq \lceil \log_M l \rceil$  or  $h = \lceil \log_M l \rceil$

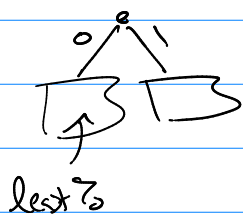
④  $|E| = n - 1$

# 11.2 Applications (4 probs)

(1) binary search tree. (ex) Matt, apple, bat, nat, Mip, an  
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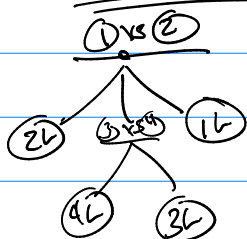


(2) Huffman code 1-objects  $S_1: ?$   $S_2: ?$   $S_3: ?$  ...  $S_n: ?$



- a) we will have  $>$  symbols.  $\rightarrow$  Make tree
- b) encode a word
- c) decode a bit string

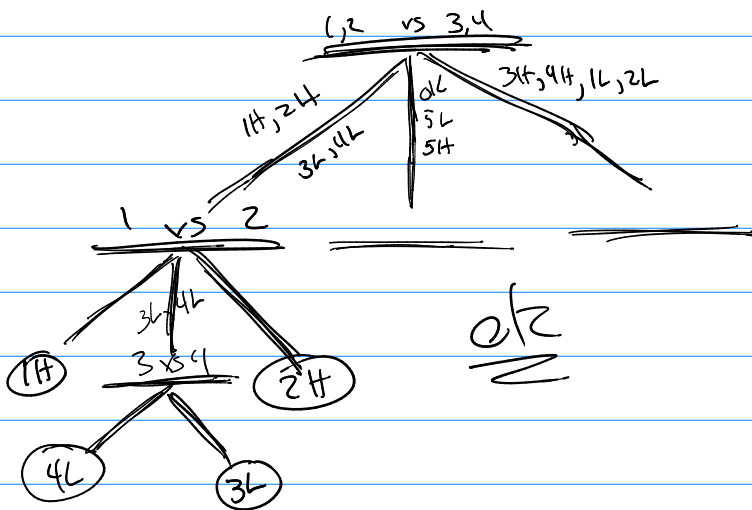
(3) Coin decision tree / exact type: (ex) 4 coins and one is a light fake



"hard" type: (ex) 5 coins and one may be fake  
 & it is it is light or heavy.

$$h \geq \lceil \log_2 2 \rceil$$

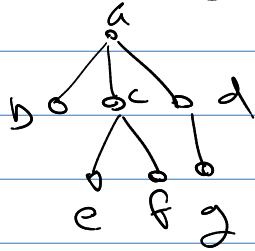
$$h \geq \lceil \log_3 11 \rceil = 3$$



④ Game Tree (~~9/11~~)

11.3 Tree Traversals (2 probs)

① tree  $\rightarrow$  give the 3 traversals

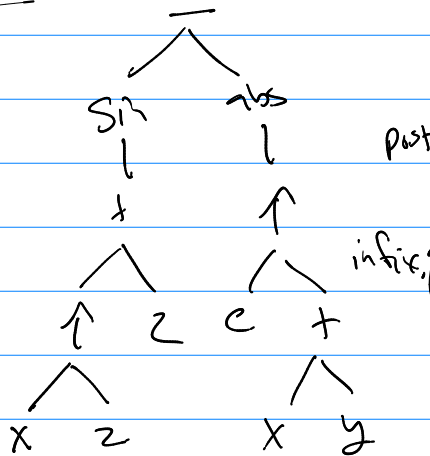


pre-order: a, b, c, e, f, d, g  
 in-order: b, a, e, c, f, g, d  
 post-order: b, e, f, c, g, d, a

② given textbook notation  $\rightarrow$  tree  $\rightarrow$  all 3 notations

$\sin(x^2 + 2) - \cos(e^{x+y})$

D



prefix: -, sin, +, ^, x, 2, 2, cos, ^, e, +, x, y

postfix: x, 2, ^, 2, +, sin, e, x, y, +, ^, cos, -

infix: ((x, ^, 2), +, 2), sin, -, (e, ^, (x, +, y)), cos

ch 12 12.1 / 12.2 (4 probs) Boolean Algebra

- ① Verify some law(s) by table
- ② Verify some law(s) by using the base 5 of Boolean Alg.  
 like p. 81a # 25-3a

③ Minterm expansion of boolean function

④ Maxterm expansion of boolean function.

How?

tech # 1 table

tech # 2 use laws to get the expansion.