Formal Languages and Antometa Theory What to do How to do What is a language? Let U be a universal set Any mobset L of U in a language. Examples: English Language U -> The act of all strings over the "English" alphabet  $\{\alpha, -, 7\}$   $\cup$   $\{A, -, 7\}$   $\cup$   $\{A, -, 7\}$ abc d# "ef" -> not English

pray be defined by English grammar. Other languages  $U = INT = \{1, 2, 3, \dots \}$ - E = the set of even numbers in M = {2,4,6,8,...} language of even numbers - IP = the language of primer = {2,3,5,7,11,...}

G = the net of all undirected graphs (U) C C G T C G — The language of dure connected graphs T C G — The language of trees Computational problem Let L be a language (U universal set) Given  $X \in U$ , decide whether  $X \in L$ . Langhage-membership problem

English Professor's problem primality testing problem Prime checking whether a graph is Functional problems Factoring
Outfort n = p, p2 --- pk ) can be rephrased by agmiralent Criven nand k, decide whether n has a trime factor

M, k  $\longrightarrow D$   $\longrightarrow N$ n, In \_\_\_\_ n is prime By making a binary search, I can find the smallest frime - factor n/p factor p of n

Criven G, C, decide

(cost

weighted graph

(n-1) whether Gran a ST
of cost SC. (n-1) Cost (MST)

(n-1) Cost ( Cost (MST) = 0 for all edger e, ask the decider whether G-E has an BT of cost & C X Y G:= G-E

Repeat until exactly n-1 edger stay. Weepe in G.

## Representation issues

U \_\_\_\_ consisting of members

Griven Land x EU, decide whether x EL

How?