- **Decidable Languages**: Some TM exists which will accept any string w that is in L, and reject any string not in L. The TM always halts.
  - (p. 194) **A_{DFA}** = {<B,w>| B is a DFA that accepts w}
  - (p. 195) **A_{NFA}** = {<B,w>| B is an *NFA* that accepts w}
  - (p. 196) **A_{REX}** = {<R,w>| R is a regex that generates w}
  - (p. 196) **E_{DFA}** = {<A>| A is a DFA where L(A) = Φ}
  - (p. 197) **EQ_{DFA}** = {<A,B>| A,B both DFAs & L(A) = L(B)}
  - (p. 198) **A_{CFG}** = {<G,w>|G is a CFG that generates w}
  - (p. 199) **E_{CFG}** = {<G>|G is a CFG & L(G) = Φ}
  - (p. 200) Every CFL is decidable
  - (Prob. 4.3) **ALL_{DFA}** = {<A>| A a DFA and L(A)=Σ*}
  - (Prob. 4.4) **$A\varepsilon_{CFG}$** = {<G>| G a CFG that generates ε}
  - (Prob. 4.10) **$INFINITE_{DFA}$** = {<A>| A a DFA, L(A) is infinite}
  - (Prob. 4.11) **$INFINITE_{PDA}$** = {<A>| A a PDA, L(A) is infinite}

- **Undecidable Languages**: A decider does not exist.
  - (p. 202) **$HALT_{TM}$** = {<M,w>| M is a TM that halts on w}
  - (p. 207) **A_{TM}** = {<M,w>| M accepts w}
  - (p. 217) **E_{TM}** = {<M>| M is a TM and L(M)=Φ}
  - (p. 218) **$REGULAR_{TM}$**={<M>|M a TM & L(M) is regular}
  - (p. 219) **L_P** = {<M>| M a TM such that L(M) has property P}
  - (p. 220) **EQ_{TM}** = {<M1,M2>|M1, M2 TMs, L(M1)=L(M2)}
  - (p. 222) **A_{LBA}** = {<M,w>| M an LBA that accepts w}
  - (p. 223) **E_{LBA}** = {<M>| M an LBA where L(M) is empty}
  - (p. 225) **ALL_{CFG}** = {<G>| G is CFG where L(G)=Σ*}
  - (p. 228) **PCP** = {<P> | P instance of Post Correspondence Problem)

- **Recognizable Languages**: Some TM exists which can accept any string w that is in L, and will not accept any string not in L. No guarantees that TM will even halt for w not in L.
- **co-Turing Recognizable Languages**: a TM recognizer exists for the complement of the language
  - (Prob. 4.5) **E_{TM}** = {<M>| M is a TM and L(M)=Φ}
- If L is both recognizable and co-Turing recognizable then it is decidable

- **Class P**: decidable by a 1-tape TM in poly time
  - (p. 287) **PATH** = {<G,s,t>| G is directed graph (V,E), with path from s to t}
  - (p. 289) **RELPRIME** = {<x,y>|x,y relatively prime}
  - (Prob. 7.8) CONNECTED = {<G>| G is a connected undirected graph}
  - (Prob. 7.9) TRIANGLE = {<G>|G contains a triangle}
  - (Prob. 7.10) ALL_{DFA}
  - (Prob. 7.13) MODEEXP = {(a,b,c,p)|positive binary integers such that a^b = c mod p)
  - (p. 290) Every context-free language is in P
- **Class NP**: Not in P but a poly time NTM exists (* in NP-Complete)
  - ***HAMPATH** = {(G,s,t)|G is graph with Hamiltonian path from s to t}
  - **COMPOSITES** = {x|x=pq, for p,q>1}
  - ***CLIQUE** = {<G,k>|G undirected graph with k-clique}
  - ***SUBSET-SUM** = {<S,t>|S = {x_1, …x_k}
  - ***SAT** = {wff| wff is satisfiable}
  - ***VERTEXCOVER** = {<G,k>|G has a k-node vertex cover}