11-722: Grammar Formalisms: Homework 3 Categorial Grammar

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Basic Categorial Grammar:

forward application	A/B + B = A
backward application	B + A\B = A
composition	A/B + B/C = A/C
conjunctions	A CONJ A' = A"
type raising	A = X/(X\A)

(1) Show syntacic analysis of the following sentences using the above syntax CCG rules and the following lexical entries

```
John NP
Mary NP
Jill NP
Bob NP
flowers NP
chocolates NP
walks S\NP
and CONJ
```

```
like (S\NP)/NP
likes (S\NP)/NP
dislikes (S\NP)/NP
a NP/N
man N
gave (S\NP)/NP/NP
```

> John walks
> John likes Mary
> John and Mary like Bob
> John likes and Mary dislikes Bob
> a man walks John gave Mary flowers and Jill chocolates

(2) Show syntactic and semantic analysis of the following sentences

```
A/B:S + B:T = A:S.T
B:T + A\B:S = A:S.T
X:A CONJ X':A' = X'':lambda S (A . S & A'. S)
X/Y:A Y/Z:B =>  X/Z: lambda Q ( A . (B . Q))
NP:a -> T/(T\NP): lambda R (R . a)

John NP:j
Mary NP:m
Bob NP:b
walks S\NP: lambda X walks(X)
and CONJ:
like (S\NP)/NP: lambda Y lambda X like(X,Y)
likes (S\NP)/NP: lambda Y lambda X likes(X,Y)
dislikes (S\NP)/NP: lambda Y lambda X dislikes(X,Y)
```

> John walks
> John likes Mary
> John and Mary like Bob
> John likes and Mary dislikes Bob

(3) Adding approrpriate features to the basic S, NP categories show how the following could be treated in a categorial framework. Show your lexical entries and the syntactic analysis, no semantic analysis is require for these examples.

I walk
You walk
He walks
He walked
the boy walks
the boy likes the movie
the boys like the movie