

## Equivalent $\Sigma$ , F derivations, Phrase Markers, and Reduced Phrase Markers

$\Sigma$ : S

F:

S  $\rightarrow$  NP VP            VP  $\rightarrow$  V NP  
 NP  $\rightarrow$  John            V  $\rightarrow$  likes  
 NP  $\rightarrow$  Mary

The **equivalent  $\Sigma$ , F** derivations of "John likes Mary", given the above  $\Sigma$ , F grammar:

<p style="text-align: center;">S</p> <p>NP    VP</p> <p>John    VP</p> <p>John    V NP</p> <p>John    likes NP</p> <p>John    likes Mary</p>	<p style="text-align: center;">S</p> <p>NP    VP</p> <p>John    VP</p> <p>John    V NP</p> <p>John    V Mary</p> <p>John    likes Mary</p>	<p style="text-align: center;">S</p> <p>NP    VP</p> <p>NP    V NP</p> <p>John    V NP</p> <p>John    likes NP</p> <p>John    likes Mary</p>
<p style="text-align: center;">S</p> <p>NP    VP</p> <p>NP    V NP</p> <p>John    V NP</p> <p>John    V Mary</p> <p>John    likes Mary</p>	<p style="text-align: center;">S</p> <p>NP    VP</p> <p>NP    V NP</p> <p>NP    likes NP</p> <p>John    likes NP</p> <p>John    likes Mary</p>	<p style="text-align: center;">S</p> <p>NP    VP</p> <p>NP    V NP</p> <p>NP    V Mary</p> <p>John    V Mary</p> <p>John    likes Mary</p>
<p style="text-align: center;">S</p> <p>NP    VP</p> <p>NP    V NP</p> <p>NP    likes NP</p> <p>NP    likes Mary</p> <p>John    likes Mary</p>	<p style="text-align: center;">S</p> <p>NP    VP</p> <p>NP    V NP</p> <p>NP    V Mary</p> <p>NP    likes Mary</p> <p>John    likes Mary</p>	

The **Phrase Marker** of "John likes Mary", given the above  $\Sigma$ , F grammar:

{S, NP VP, NP V NP, NP likes Mary, NP V Mary, NP likes NP, John VP, John V NP, John V Mary, John likes NP, John likes Mary}

[This set consists of all the lines occurring in any of the equivalent derivations of "John likes Mary", given the above  $\Sigma$ , F grammar]

The **Reduced Phrase Marker** of "John likes Mary", given the above  $\Sigma$ , F grammar:

{S, NP likes Mary, John VP, John V Mary, John likes NP, John likes Mary}

[This set is the subset of the Phrase Marker consisting of the terminal string plus all the monostings (the strings containing exactly one non-terminal surrounded by any number of terminal symbols) Lasnik and Kupin observed that this set suffices to compute all the 'is a' relations.]

**Collapsed derivation tree** for "John likes Mary", given the above  $\Sigma$ , F grammar:

