\[ P \times r s b g \]

\[ 1 \varepsilon \delta 2 \varepsilon 1 \]
\[ 2 \ll (2, 2, 2) \ll 2 \]

\[ A_{11} \rightarrow \varepsilon A_{22} \varepsilon \]
\[ A_{22} \rightarrow (A_{22}) \]
\[ A_{11} \rightarrow \zeta \]
\[ A_{22} \rightarrow \varepsilon \]
\[ A_{11} \\
A_{12} \\
A_{22} \\
A_{22} \rightarrow A_{22} A_{22} \]

NB: G can be simplified. E.g., remove \( A_{12}, A_{21} \) and all rules using them since, e.g., there is no \( \varepsilon \) at \( A_{21} \). This is just what we want in the construction, since there is no \( \varepsilon \) at \( [2, 6, x] \).
Claim: \( \forall x \leq 2^n \exists y \geq x \)

\[ [p, e, x] \iff [y, e, e] \]

Cor:
\[ L(G) = L(M) \]

since \( L(G) = \{ x \mid A(x) \text{ true, find } \exists x \} \)

\[ \iff \{ x \mid \text{ find, } e, x \} \iff \{ \text{find, } e, e \} \]

\[ \iff L(M) \]

\[ \iff \text{def.} \]
Claim \( \iff \) induct on deriv length

**Basis**

\[
A \vdash \vdash x : \text{ impossible; nothing to prove}
\]

**Induction Hypothesis**

\[
A_n \vdash x : \text{ must the } x = \varepsilon, P \vdash \gamma \\
[\gamma, \varepsilon, \varepsilon] \vdash \varepsilon, \varepsilon, \varepsilon = 3
\]

**Induction Step**

\[
A_{k+1} \Rightarrow A_k \vdash A_{k+1} \text{ Ar } b \Rightarrow A_{k+1} \text{ Ar } b \\
\text{ case (ii):} \\
x = a \gamma \beta \text{ & Ar s}
\]

by rule

\[
[\varepsilon, \varepsilon, \gamma] \vdash [\varepsilon, \varepsilon, \varepsilon] \\
[\varepsilon, \varepsilon, a \gamma \beta] \vdash [\varepsilon, \beta, \gamma \beta] \vdash [\varepsilon, \varepsilon, \varepsilon]
\]

Since

\[
\text{ since } \mathcal{D}(\mathcal{L})
\]

**Induction**

\[
\text{ or } \\
\text{ or }
\]

```

```

\[ P + \text{race } \rightarrow \]

\[ P \]

\[ \rightarrow \]

\[ \rightarrow \]

\[ \rightarrow \]

\[ \rightarrow \]
"direction of claim is similar, by induction on \# of steps in \( T \):

- **Basis**: 0 steps, use rule in \( S \)
- **Ind**: \( k+1 \) \( \geq \) 0 steps, then

  Stack either is (case i) or is not (case ii) empty at some intermediate step.

In case i, I.H. & construction give \( Apq \rightarrow AprArs \) etc.

In case ii, \( Apq \rightarrow aArsb \) etc.

This construction & proof are just like the text's version, no more details than.