

8) *Lösung.*

$$\frac{\frac{x = 1 \in E}{E \vdash x = 1} [a] \quad \frac{x = 1 \in E}{E \vdash x = 1} [a]}{\frac{E \vdash 0 = 1}{E \vdash 0+0 = 1+1} [s, \sigma]} \quad \frac{\frac{x = 1 \in E}{E \vdash x = 1} [a] \quad \frac{x = 1 \in E}{E \vdash 0 = 1} [k]}{\frac{E \vdash x = 1}{E \vdash 0 = 1} [s, \sigma]} [k]}{E \vdash (0+0) \cdot 0 = (1+1) \cdot 1} [k]$$

Mit der Substitution $\sigma = \{x \mapsto 0\}$.

□

9) *Lösung.* **a)** $G = (\{S, B\}, \{a, b\}, R, S)$ mit den Regeln R :

$$S \rightarrow aB \mid bS \mid \epsilon$$

$$B \rightarrow bB \mid aS$$

b) $\underline{S} \Rightarrow a\underline{S} \Rightarrow ab\underline{S} \Rightarrow aba\underline{B} \Rightarrow aba\underline{B} \Rightarrow abab$

□

10) *Lösung.*

```
while  $x_2 \neq 0$  do
   $x_2 := x_2 - 1$ 
end;
while  $x_1 \neq 0$  do
   $P_+(x_2, x_1, x_3)$ ;
   $x_1 := x_1 - 1$ 
end
```

□

7) Lösung.

$$\frac{\frac{\frac{\frac{\frac{\frac{[z]}{[a]} \{x_1 + 1 = 1\} x_1 := x_1 + 1 \{x_1 = 1\}}{\frac{[z]}{[a]} \{x_1 = 1\} x_1 := x_1 + 1 \{x_1 = 1\}}}{\frac{[z]}{[a]} \{x_1 = 0\} x_1 := x_1 + 1 \{x_1 = 1\}}}{\frac{[z]}{[a]} \{x_1 = 1\} x_1 := x_1 + 1 \{x_1 = 2\}}}{\frac{[z]}{[a]} \{x_1 + 1 = 1\} x_1 := x_1 + 1 \{x_1 = 2\}} \frac{\frac{\frac{\frac{[z]}{[a]} \{odd(x_1 + 1)\} x_1 := x_1 + 1 \{odd(x_1)\}}{\frac{[z]}{[a]} \{x_1 = 2\} x_1 := x_1 + 1 \{odd(x_1)\}}}{\frac{[z]}{[a]} \{x_1 = 1\} x_1 := x_1 + 1 \{odd(x_1)\}}}{\frac{[z]}{[a]} \{odd(x_1 + 1)\} x_1 := x_1 + 1 \{odd(x_1)\}} \frac{[s]}{[s]}}$$

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- ¹ mit $(x_1 = 0) \models (x_1 + 1 = 1)$
- ² mit $(x_1 = 1) \models (x_1 + 1 = 2)$
- ³ mit $(x_1 = 2) \models (odd(x_1 + 1))$

□