Exercise 8.10: Write and solve the constraints that are generated by the inter-procedural sign analysis for the program from Exercise 8.4, this time with context sensitivity using the call string approach with $k = 1$. (Even though this program does not need context sensitivity to be analyzed precisely, it illustrates the mechanism behind the call string approach.)

解答：

Constraint for entry node v of function inc(a):

$$[\![v]\!](c) = \bigcup_{\substack{w \in pred(v) \\ \wedge c = w \\ \wedge c' \in Contexts}} s_w^{c'}$$

其中 $s_w^{c'}$ 表示从上下文 c 中节点 w 的调用创建的抽象状态:

$$s_w^{c'} = \begin{cases} unreachable(if\ [\![w]\!](c') = unreachable) \\ \bot[a \mapsto eval([\![w]\!](c'), 17)](otherwise) \end{cases}$$

$$s_w^{c'} = \begin{cases} unreachable(if\ [\![w]\!](c') = unreachable) \\ \bot[a \mapsto eval([\![w]\!](c'), 87)](otherwise) \end{cases}$$

Constraint for after-call node v labeled X = □ ,with call node v' and exit node w∈ pred(v):

$$[\![v]\!](c) = \begin{cases} unreachable(if\ [\![v']\!](c) = unreachable \vee [\![w]\!](v') = unreachable) \\ [\![v']\!](c)[X \mapsto [\![w]\!](v'), (18)](otherwise) \end{cases}$$

$$[\![v]\!](c) = \begin{cases} unreachable(if\ [\![v']\!](c) = unreachable \vee [\![w]\!](v') = unreachable) \\ [\![v']\!](c)[X \mapsto [\![w]\!](v'), (88)](otherwise) \end{cases}$$