11-1/ let f = λ(b). set-box! b 3;
5

let x = box 0
let y = f x
unbox x

J6

let x = box 0
set-box! x 3
unbox x

⇒

J7

let x = 0
set! x 3
x

lvalue

11-2/ J_7: $e ::= \ldots \mid \texttt{set!}\ x\ e$

OLD(J_6):

$$\Sigma \,/\, E[(\lambda x.e)\ v] \to \Sigma \,/\, E[e[x \leftarrow v]]$$

NEW(J_7):

$$\Sigma \,/\, E[(\lambda x.e)\ v] \to \Sigma[\sigma \mapsto v] \,/\, E[e[x \leftarrow \text{unbox } \sigma]]$$

$$\Sigma \,/\, E[\texttt{set!}\ (\text{unbox } \sigma)\ v] \to \Sigma[\sigma \mapsto v] \,/\, E[v]$$

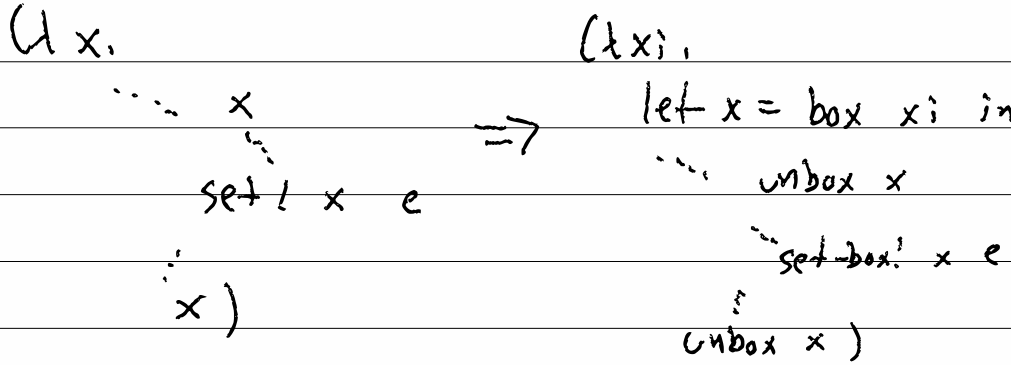
11-3/ $CESK_0$: $st = (e, env : x \rightharpoonup v, sto : \sigma \rightharpoonup v, k)$

$\Downarrow$

$CESK_1$: $st = (e, env : x \rightharpoonup \sigma, sto : \sigma \rightharpoonup v, k)$

11-4/ translator $J_7 \Rightarrow J_6$

(vars) (box, no variables)



11-5/

desugar^{BV} ["lambda", f, [x], b]

⇒ lambda f (xi) if (modified b) then

desugar^{BV} ["let", x, xi, "in",

desugar BV' b]

ow \f(x)b]

where BV' = BV ∪ {x}

desugar BV x = if x ∈ BV then

unbox x

ow x

11-6/

```
(define (even? x)
  (if (= x 0) true
      (not (odd? (- x 1)))))
(define (odd? x)
  (if (= x 0) false
      (not (even? (- x 1)))))
```

desugar

(letrec ([x_0 e_0] ... [x_n e_n]) e_b)

⇒ (let ([x_0 Unit] ... [x_n unit])
(set! x_0 e_0) ... (set! x_n e_n)
e_b)