Homework 2

昂伟 *PB11011058*

problem 1

$(\lambda p.\lambda q.\lambda r.p\ q\ r)(\lambda p.\lambda q.p\ q\ r) \to (\lambda s.\lambda t.\lambda u.s\ t\ u)(\lambda p.\lambda q.p\ q\ r)$
$\to \lambda t.\lambda u.(\lambda p.\lambda q.p\ q\ r)t\ u \to \lambda t.\lambda u.(\lambda q.t\ q\ r)u \to \lambda t.\lambda u.t\ u\ r$
$\to r$

If we don't rename bound variables, free variable r be bound. So rename bound variables so that all bound variables are different from each other and different from all of the free variables.

problem 5

(a)$< x+y, \sigma > \to < 2+y, \sigma > \to < 2+3, \sigma > \to < 5, \sigma >$
(b)$< x = x+3, \sigma > \to < x = 1+3, \sigma > \to < x = 4, \sigma > \to < 4, Put(\sigma, x, 4) >$
(c)$< (x = 3) + x, \sigma > \to < 3 + x, Put(\sigma, x, 3) > \to < 3+3, \sigma' > \to < 6, \sigma' >$
(d)$< x = (x = x+3)+(x = x+5), \sigma > \to < x = (x = 1+3)+(x = x+5), \sigma >$
$\to < x = (x = 4)+(x = x+5)\sigma > \to < x = 4+(x = x+5), Put(\sigma, x, 4) > \to < x = 4+(x = 4+5), \sigma' > \to < x = 4+(x = 9), \sigma' > \to < x = 4+9, Put(\sigma', x, 9) > \to < x = 13, \sigma'' > \to < 13, Put(\sigma'', x, 13) >$

problem 6

(a) 2
(b) 4
(c) 3

problem 7

(a) $\omega = 8$
(b)

Activation Records

(1)	access link	(0)
	f	·
	h	·
(2)	access link	( )
	x	
(3) f(1)	access link	( )
	x	
(4)	access link	( )
	h	·
(5)	access link	( )
	w	
(6) h(3)	access link	( )
	z	
(7) f(3)	access link	( )
	y	

Closures	*Compiled Codes*
<( ), ·>	$\|codeforf\|$
<( ), ·>	$\|codeforh\|$

problem 8

(a)

Activation Records

(1)	access link	(0)
	f	·
	h	·
(2) h(2)	access link	( )
	x	
(3) f(1)	access link	( )
	x	

Closures	*Compiled Codes*
A<( ), ·>	$\|function, line1\|$
B<( ), ·>	$\|function, line3\|$

(b) B

(c) 第二行之后调用 $h(2)$ 会调用 $f_1(2)$ 然后再调用 $f_1(1)$; 而第四行调用 $h(2)$ 时,f 已经被修改并指向 $f_3()$, 所以会先调用 $f_1(2)$ 再调用 $f_3(1)$.

(d)

Activation Records

(1)	access link	(0)
	f	·
	h	·
(2) h(2)	access link	( )
	x	
(3) g(1)	access link	( )
	x	

Closures	*Compiled Codes*
A<( ), ·>	$\|function, line1\|$
B<( ), ·>	$\|function, line3\|$

(e)$h(2) = 2$. 先调用 $g(2)$ 再调用 $g(1)$.