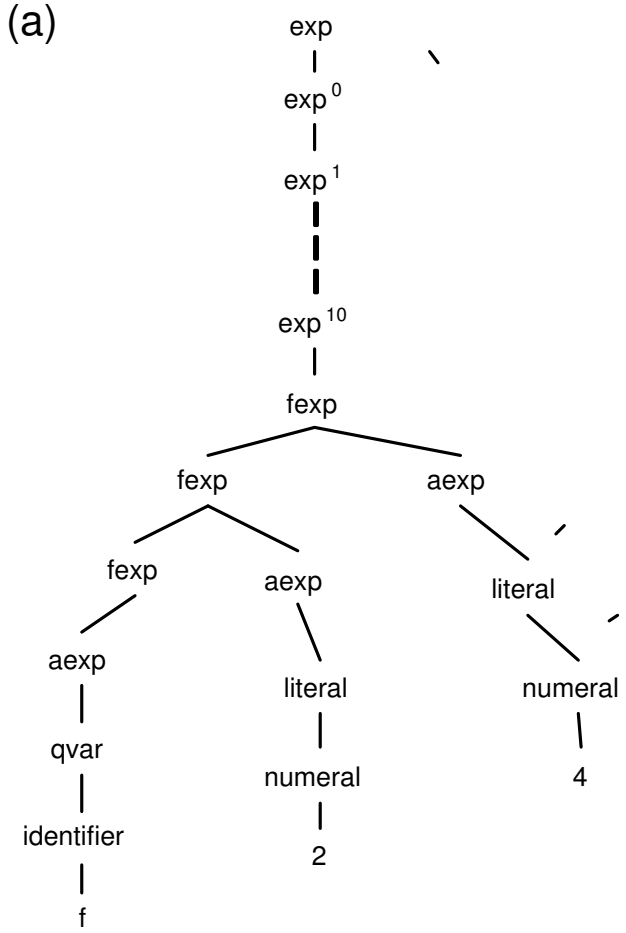
Fall 2005 22C:111

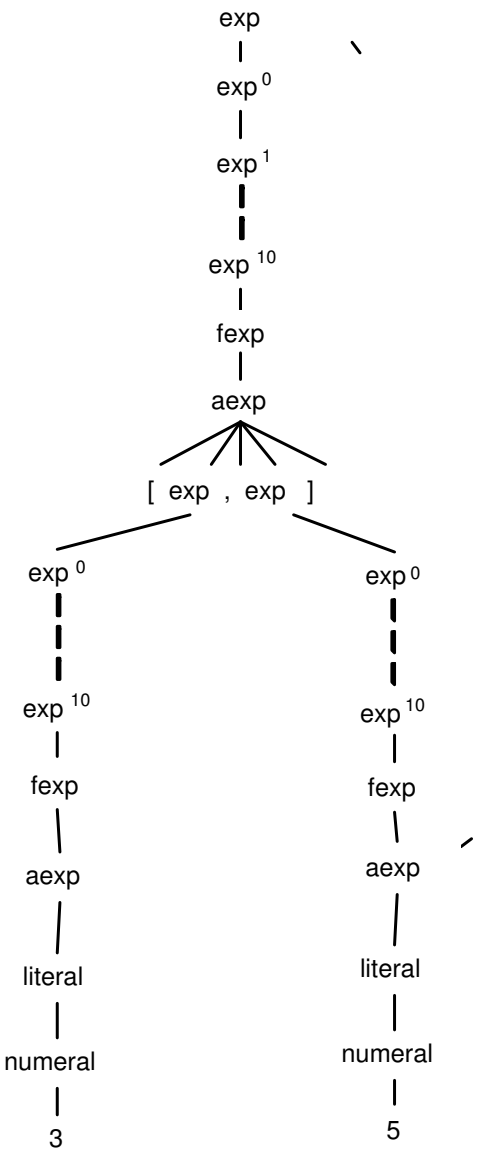
Homework3 Solution

Problem 1:

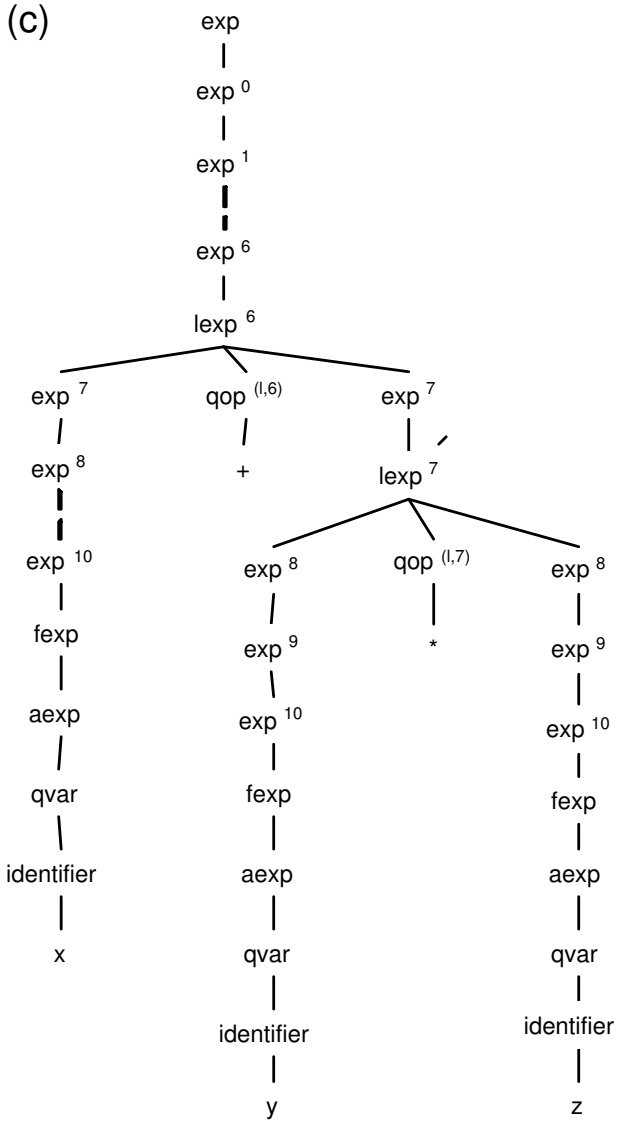
(a)

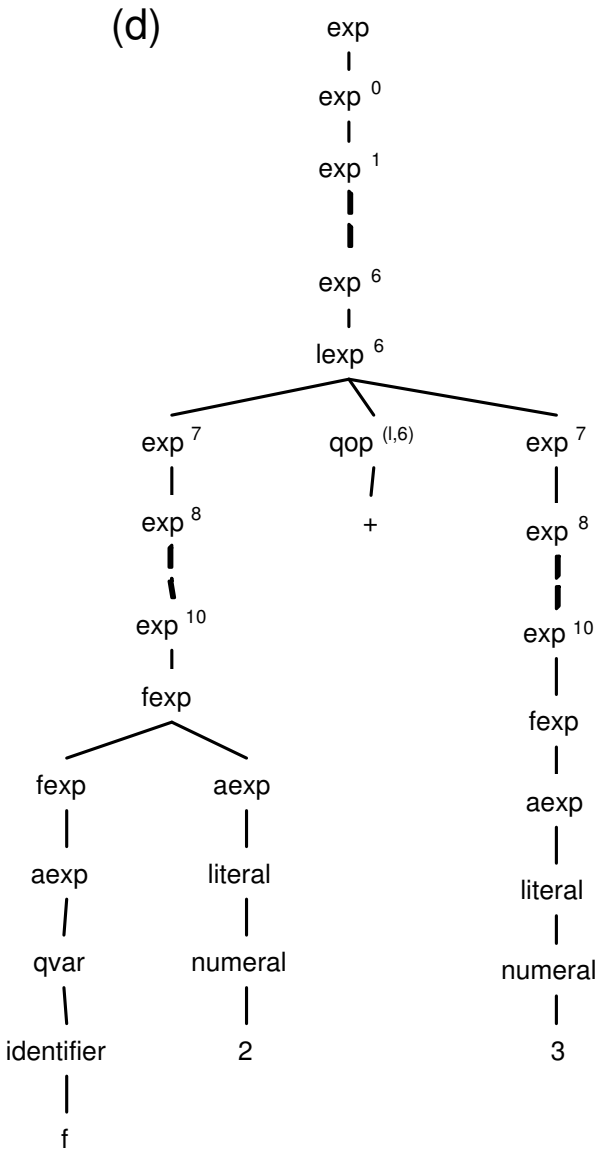


(b)


exp
exp 0
exp 1
exp 10
fexp
aexp
[exp , exp]
exp 0
exp 10
fexp
aexp
literal
numeral
3
exp 0
exp 10
fexp
aexp
literal
numeral
5

(c)


exp
exp 0
exp 1
exp 6
lexp 6
exp 7
qop (l,6)
exp 7
exp 8
+
lexp 7
exp 10
exp 8
qop (l,7)
exp 8
fexp
exp 9
*
exp 9
aexp
exp 10
exp 10
qvar
fexp
fexp
identifier
aexp
aexp
x
qvar
qvar
identifier
identifier
y
z



Problem 2:

(a) sqrt 4+5

type: $Floating\ a \Rightarrow a$

result: 7.0

explain: Since function application has the highest priority, the expression will be evaluated as (sqrt 4)+5.

(b) 'a':'b':[]

type: [Char]
result: "ab"
explain: 'a':('b':[]), : right associative. The type [Char]≡ String.

(c) (2*)3

type: Num a ⇒ a
result: 6
explain: 2*3, * is an infix operator, (2*) is partial function application.

(d) [(*),(+)]

type: [Integer -> Integer -> Integer]
result: ERROR - Cannot find "show" function for Expression : [(*),(+)]
explain: (*) and (+) are the representation for the infix operator '*' and '+'. The expression is a list of type: Integer -> Integer -> Integer functions.

(e) fst $((<),(/))$ 3 5

type: (Num a, Ord a, Fractional b) => Bool
result: True
explain: fst is a function with type (a,b)-> a. So fst $((<),(/))$ 3 5 evaluates to (fst $((<),(/))$) 3 5 => $(<)$ 3 5. Since $(<)$ is an infix operator with type of: Ord a => a − > a − > Bool, the value of the expression is 'True' because 3<5.

Problem 3:

```
pal [] = True      -- empty list is a palindrome

pal (y:[]) = True  -- list with one item is a palindrome

pal (x:xs) = x==last xs && pal (init xs)  -- check first and last

                   -- item same, remove them and test rest
```

Problem 4:

```
isVowel x | elem x "aeiou"       = True
          | otherwise            = False
```