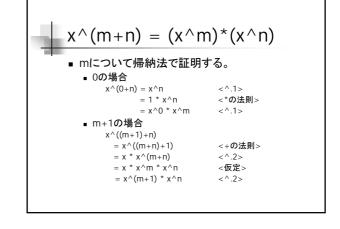
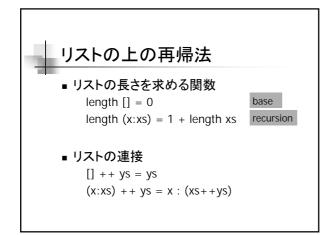
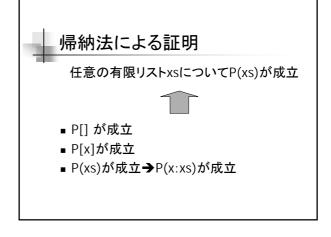


■ P(n),p(n-1)が成立→P(n+1)が成立







```
length (xs++ys) = length xs + length ys
xsに関する帰納法で証明する
   ■ []の場合
        length ([]++ys)
             = length ys
                                        <++.1>
             = 0 + length ys
                                       <length.1>
             = length [] + length ys
   ■ x:xsの場合
        length ((x:xs)++ys)
            = length (x:(xs++ys))
                                        <++.2>
             = 1 + length (xs++ys)
                                        <length.2>
             = 1 + length xs + length ys
                                        <仮定>
             = length (x:xs) + length ys
                                        <length.2>
```

```
リスト演算

■ Zip 2引数関数:3つの場合

zip [] ys = []

zip (x:xs) [] = []

zip (x:xs) (y:ys) = (x,y) : zip xs ys

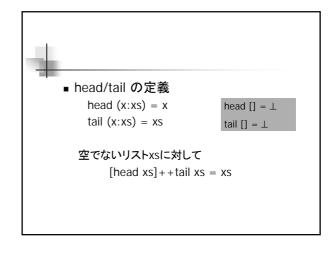
■ length (zip xs ys) = min (length xs) (length ys)

■ 証明: 場合1:xs=[], ys
場合2: (x:xs), ys=[]
場合3: (x:xs), (y:ys)
```

```
■ Take/dropの再帰的な定義
take 0 xs = []
take (n+1) [] = []
take (n+1) (x:xs) = x: take n xs

drop 0 xs = xs
drop (n+1) [] = []
drop (n+1) (x:xs) = drop n xs

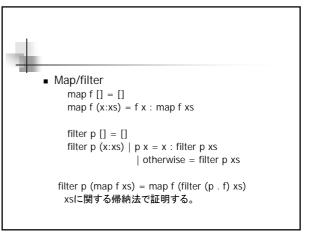
■ 証明: take n xs ++ drop n xs = xs
```



```
■ Init/last
init [x] = []
init (x:x':xs) = x : init (x':xs)

last [x] = x
last (x:x':xs) = last (x':xs)

init xs = take (length xs -1 ) xs
xslこ関する帰納法で証明する。
```



補助関数

■ 補助関数

```
xs \(\frac{\pmathbf{y}}{2}\) [] = xs

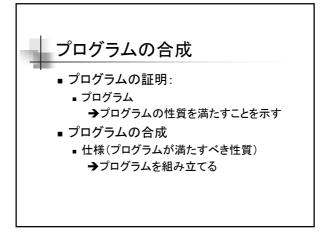
xs \(\frac{\pmathbf{y}}{2}\) (y:ys) = remove xs y \(\frac{\pmathbf{y}}{2}\) ys

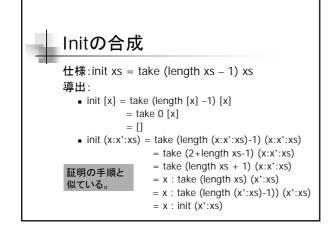
remove [] y = []

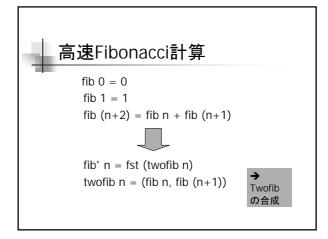
remove (x:xs) y | x==y = xs

| otherwise = x : remove xs y
```









```
twofib 0 = (fib \ 0, fib \ 1)

= (0,1)

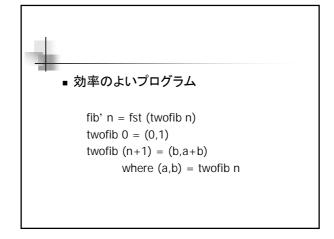
twofib (n+1)

= (fib \ (n+1), fib \ (n+2))

= (fib \ (n+1), fib \ n + fib \ (n+1))

= (b,a+b)

where (a,b) = twofib \ n
```



お知らせ

- 次回
 - 日時:12月17日、8:30-10:00
 - 場所:教育用計算機センター5階
 - 内容:演習+中間テスト(20%)
 - テストの内容:教科書の演習問題