TÖL304G Forritunarmál Verkefnablað 5

Hópverkefni 5

1.

```
;; Use: (modpow p q r)
;; Pre: p,q and r are integers, q >= 0, 0 <= p < r and r > 1
;; Value: The remainder when r is divided into p to the power q
(define (modpow p q r)
  ;; Use: (help n acc total)
  ;; Pre: n, acc, and total are integers, acc >= 0
  ;; Value: The remainder when r is divided into n raised to the power
  ;;        of acc, accumulated with the current total
  (define (help n acc total)
    (if (= acc 0)
        (remainder total r)
        (if (= 0 (remainder acc 2))
            (help (remainder (* n n) r) (/ acc 2) total)
            (help n (- acc 1) (remainder (* total n) r)))))
  (help p q 1))

(modpow 123 1234567890 12345678901)
(modpow 2 10 10000)
```

```
14 (modpow 123 1234567890 12345678901)
15 (modpow 2 10 10000)
```

```
Welcome to DrRacket, version 8.14 [cs].
Language: R5RS; memory limit: 128 MB.
10385213685
1024
>
```

2.

```
;; Notkun: (cornerstream s n)
;; Fyrir: s er óendanlegur straumur óendanlegra
;; strauma,
;; s=[[x11 x12 ...],[x21 x22 ...] ...].
;; n er heiltala, n>=0.
;; Gildi: Listinn
;; ((x11 x12 ... x1n)
;; (x21 x22 ... x2n)
;; ...
;; (xn1 xn2 ... xnn)
;; )
(define (cornerstream s n)
  (stream-list (stream-map (lambda (x) (stream-list x n)) s)
               n)
)

;; Skilgreinir s sem óendanlegann straum af óendanlegum straumum.
(define s (cons-stream heil s))

(cornerstream s 5)
```

```
393 ;; Skilgreinir s sem óendanlegann straum af óendanlegum straumum.
394 (define s (cons-stream heil s))
395
396 (cornerstream s 5)
397
```

```
Welcome to DrRacket, version 8.14 [cs].
Language: R5RS; memory limit: 128 MB.
((1 2 3 4 5) (1 2 3 4 5) (1 2 3 4 5) (1 2 3 4 5) (1 2 3 4 5))
>
```

3.

```
;; Notkun: (mulstreams x y)
;; Fyrir: x og y eru óendanlegir straumar talna,
;; x=[x1 x2 x3 ...].
;; y=[y1 y2 y3 ...].
;; Gildi: Óendanlegur straumur óendanlegra strauma
;; talna sem er
;; [[x1*y1 x2*y1 x3*y1 ...]
;; [x1*y2 x2*y2 x3*y2 ...]
;; [x1*y3 x2*y3 x3*y3 ...]
;; .
;; .
;; .
;; ]
(define (mulstreams x y)
  (stream-map (lambda (a) (stream-map (lambda (b) (* b a)) x)
  )y
 ))

(cornerstream(mulstreams heil heil) 5)
```

```
416 (cornerstream(mulstreams heil heil) 5)
417
```

```
Welcome to DrRacket, version 8.14 [cs].
Language: R5RS; memory limit: 128 MB.
((1 2 3 4 5) (2 4 6 8 10) (3 6 9 12 15) (4 8 12 16 20) (5 10 15 20 25))
>
```

4.

```
;; Use: (powerlist n)
;; Pre: n is an integer, n>=0.
;; Value: The list (y1 y2 y3 ...)
;; that contains all lists that can be
;; constructed by taking zero or more
;; values from {1,...,n}
;; and concatenating them in a list in
;; descending order.
(define (powerlist n)
  (if (= n 0)
      '(())
      (let ((previous (powerlist (- n 1))))
        (append previous
                (map (lambda (x) (cons n x)) previous)))))


(powerlist 0)
(powerlist 1)
(powerlist 2)
(powerlist 3)
```

```
433 (powerlist 0)
434 (powerlist 1)
435 (powerlist 2)
436 (powerlist 3)
```

```
Welcome to DrRacket, version 8.14 [cs].
Language: R5RS; memory limit: 128 MB.
(())
(() (1))
(() (1) (2) (2 1))
(() (1) (2) (2 1) (3) (3 1) (3 2) (3 2 1))
>
```