



CS 315

Homework 3

Recursive Functions in Scheme

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Section 1

1. **Chosen mathematical function:** $f(k) = (k + 1)^2$

• `cankara_zeynep.scm`:

```
;;; f, f(k) =(k+1)^2  
(define (f k)  
  (+ (+ (* 2 k) (* k k)) 1))
```

• Output:

```
(f 0)  
=> 1  
(f 1)  
=> 4  
(f 10)  
=> 121
```

2. **Recursive sum-of-f(k):** $\text{sum-of-f}(k) = f(k) + \text{sum-of-f}(k-1)$

• `cankara_zeynep.scm`:

```
;;; sum-of-f: sum-of-f(k) = f(k) + sum-of-f(k-1)  
(define (sum-of-f k)  
  (if (< k 1) (f k) (+ (f k)  
                        (sum-of-f (- k 1)))))
```

• Output:

```
(sum-of-f 0)  
=> 1  
(sum-of-f 1)  
=> 5  
(sum-of-f 10)  
=> 506
```

3. Tail recursive sum-of-f(k): sum-of-f-tr

- `cankara_zeynep.scm`

```
;;; sum-of-f-helper, helper function of tail recursive function f
(define (sum-of-f-helper k partial)
  (if (< k 1)
      partial
      (sum-of-f-helper((- k 1) (+ k partial))))
)

;;; sum-of-f-tr, tail recursive version of sum-of-f
(define (sum-of-f-tr k)
  (sum-of-f-helper k (f 0)))
```