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Short Assignment 5

To uphold the Duke Community Standard:

- I will not lie, cheat, or steal in my academic endeavors;
- I will conduct myself honorably in all my endeavors; and
- I will act if the Standard is compromised.

Jason Wang

```
(define square-int
        (lambda ((n <integer>))
                (if (= n 0)
                        0
                        (+ n (- n 1) (square-int (- n 1))))))
```

Proof by induction on variable n

P(n): (square-int n) = n^2

Base Case:

Prove that (square-int {0}) = 0^2

(square-int {0}) by the substitution model is:

```
(if (= {0} 0)
        0
```

which is {0} and that is right as 0 = 0

Inductive Hypothesis:

There exists k, an element of the set of all natural numbers, less than n such that (square-int k) = k^2

Inductive Step:

By the substitution model:

[{proc ((n <integer>)) …} {k+1}]
As k+1 > k and k is a natural number, k+1 > 0 so
[if ({#f})
    (+ {k+1} (- {k+1} 1) (square-int (- {k+1} 1)))]
Which simplifies to:
(+ {k+1} {k} (square-int({k})))
By the inductive hypothesis,
(+ {k+1} {k} k^2)
= k^2 + 2k + 1 = (k+1)^2

Thus by induction, (square-int n) = n^2