Analysis of Algorithms

Homework 0
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Due 09/04/20

0.1 Calculate s([4, 1, 3, 2])

$$\begin{aligned}
s([4,1,3,2]) &= i(4, s([1,3,2])) \\
&= i(4, i(1, s([3,2]))) \\
&= i(4, i(1, i(3, s([2])))) \\
&= i(4, i(1, i(3, i(2, s([])))))) \\
&= i(4, i(1, i(3, i(2, [])))) \\
&= i(4, i(1, i(3, [2]))) \\
&= i(4, i(1, 2 :: i(3, []))) \\
&= i(4, i(1, [2,3])) \\
&= i(4, [1,2,3])) \\
&= 1 :: i(4, [2,3]) \\
&= 1 :: 2 :: i(4, [3]) \\
&= 1 :: 2 :: 3 :: i(4, []) \\
&= [1,2,3,4]
\end{aligned}$$

0.2 Selection Sort Functional Pseudo-Code

```
selectionSort(x, [])
return [x]
```

0.3 Pseudo-code breakdown

a Create tail recursive functional pseudo-code

$$\begin{aligned}
&powTail(b, 0; a) = a \\
&powTail(b, n; a) = powTail(b, n-1; a * b)
\end{aligned}$$

$$pow(b, n) = powTail(b, n; 1)$$

b Create imperative, iterative pseudo-code

```
powIterative(b, n, a)
while n greater than zero do
  a = a * b
```

```
    n = n - 1
end while
return a
pow(b, n) = powIterative(b, n, 1)
```