Comp 411
Principles of Programming Languages
Lecture 13
Eliminating Lambda Using Combinators

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How to Eliminate **λ**

Goal: devise a few combinators (functions expressed in lambda-notation with no free variables) that enable us to express all **λ**-expressions without explicitly using λ.

Notation: let λ* `x.M` denote λ`x.M` converted to a form that eliminates the starred λ.   Then

- λ* `x.x` → **I**   (where **I** = λ`x.x`)
- λ* `x.y` → **K y**   (where **K** = λ`y.`λ`x.y`)
- λ* `x.(M N)` → **S** (λ* `x.M`) (λ* `x.N`)
               (where **S** = λ`x.`λ`y.`λ`z.(x z)(y z)`)

Strategy: eliminate **λ**-abstractions from inside out, one-at a time. Any order works. Transformation can cause exponential blow-up. (Try converting **Y**.)

Note: **I** is technically unnecessary since **SKK = I**