Problem 1.

Given

0: $\lambda f.\lambda x.x$
succ: $\lambda n.\lambda f.\lambda x.$(f ((n f) x))
n: if n is a natural number then its semantics is the result of n applications of succ on 0.
true: $\lambda x.\lambda y.x$
false: $\lambda x.\lambda y.y$
second: $\lambda x.\lambda y.\lambda z.y$
g: $\lambda n.$((n second) false)

What is the result of

(a) (g n) when n is 0.

(b) (g n) when n results from some application succ on 0.

(c) What mathematical/logical operation is computed by g.

Solution

Problem 2.

Consider the following λ-expression:

$$Y : \lambda\text{t.}(\lambda\text{x.}(\text{t (x x)})\ \lambda\text{x.}(\text{t (x x)}))$$

Prove/disprove that (Y t) after application of several β-reductions results in (t (Y t)).

Solution