

# Programming languages - U5

Jan Dietrich - 10-100-436

## 1

bound

free

- a)  $(\lambda x. \textcolor{blue}{x}) \textcolor{red}{y} (\lambda y. \textcolor{blue}{y} \textcolor{red}{x}) \textcolor{red}{x}$
- b)  $((\lambda x. \lambda y. \lambda z. \textcolor{blue}{x} \textcolor{blue}{y} \textcolor{blue}{z}) (\lambda x. \textcolor{red}{y} \textcolor{blue}{x}) \textcolor{red}{y}) (\lambda x. \textcolor{red}{z} \textcolor{blue}{x})$
- c)  $\lambda y. (\lambda x. \textcolor{red}{z} (\textcolor{blue}{x} (\lambda x. \textcolor{blue}{y} (\textcolor{red}{z})))) (\lambda z. \textcolor{red}{y}(\textcolor{red}{x}(\textcolor{blue}{z})))$

## 2

- a)  $(\lambda x. (\lambda z. z y) x) (\lambda x. x)$   
->  $(\lambda z. z y)(\lambda x. x)$   
->  $(\lambda x. x) y$   
-> y
- b)  $(\lambda x. x x y)$   
->  $(\lambda x. x x y)(\lambda x. x x y) y$   
->  $(\lambda x. x x y)(\lambda x. x x y) y y$   
-> ...
- c)  $(\lambda x. x (x y))(\lambda u. u)$   
->  $(\lambda u. u ((\lambda u. u) y))$   
->  $(\lambda u. u y)$   
-> y