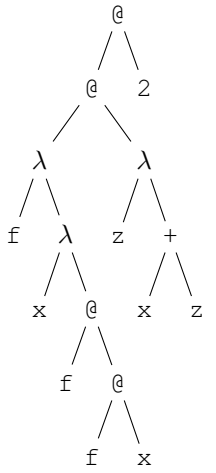
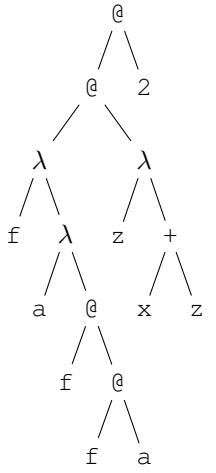
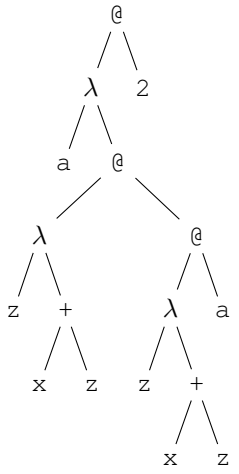
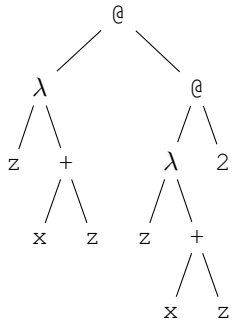
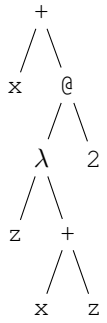
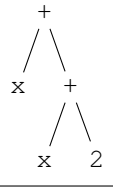
In this example, I always choose the *normal order* reduction. Normal order is always "outermost leftmost" in the AST. Note that I did this quickly. Please let me know if you spot mistakes.

expression	AST	derivation rule
$(\lambda f.\lambda x.f(fx))(\lambda z.(+xz))2$		given
$(\lambda f.\lambda a.f(fa))(\lambda z.(+xz))2$		α reduce `a` for `x` to avoid "capturing" the free `x`
$(\lambda a.(\lambda z.(+xz))((\lambda z.(+xz))a))2$		β reduce $(\lambda z.(+xz))$ for `f`

expression	AST	derivation rule
$((\lambda z.(+xz))((\lambda z.(+xz))2))$		β reduce 2 for a
$(\lambda z.(+xz))((\lambda z.(+xz))2)$	Same tree.	eliminate parens
$((+x((\lambda z.(+xz))2)))$		β reduce $((\lambda z.(+xz))2)$ for z
$(+x((\lambda z.(+xz))2))$	Same tree.	Eliminate parens.
$(+x(((+x2))))$		β reduce 2 for z
$(+x(+x2))$	Same tree.	Eliminate parens. Done.