Aufgabe 02a

$$(\lambda f \quad \underbrace{x.fx}_{GV=\{x\}} \quad)(\lambda \underbrace{zy.xy}_{FV=\{x\}})x$$

Aufgabe 02a

$$(\lambda f \quad \underbrace{x.fx}_{GV=\{x\}} \quad)(\underbrace{\lambda zy.xy}_{FV=\{x\}})x$$

$$\Rightarrow_\alpha (\lambda f \quad \underbrace{x'.fx'}_{GV=\{x'\}} \quad)(\underbrace{\lambda zy.xy}_{FV=\{x\}})x$$

Aufgabe 02a

$$(\lambda f \underbrace{x.fx}_{GV=\{x\}})(\underbrace{\lambda zy.xy}_{FV=\{x\}})x$$

$$\Rightarrow_\alpha (\lambda f \underbrace{x'.fx'}_{GV=\{x'\}})(\underbrace{\lambda zy.xy}_{FV=\{x\}})x$$

$$\Rightarrow_\beta (\lambda x'.\underbrace{(\lambda zy.xy)x'}_{GV=\{y,z\}}) \underbrace{x}_{FV=\{x\}}$$

Aufgabe 02a

$$
\begin{aligned}
&(\lambda f \underbrace{x.fx}_{GV=\{x\}})(\underbrace{\lambda zy.xy}_{FV=\{x\}})x \\
\Rightarrow_\alpha\ &(\lambda f \underbrace{x'.fx'}_{GV=\{x'\}})(\underbrace{\lambda zy.xy}_{FV=\{x\}})x \\
\Rightarrow_\beta\ &(\lambda x'.\underbrace{(\lambda zy.xy)x'}_{GV=\{y,z\}})\underbrace{x}_{FV=\{x\}} \\
\Rightarrow_\beta\ &(\lambda z \underbrace{y.xy}_{GV=\{y\}})\underbrace{x}_{FV=\{x\}}
\end{aligned}
$$

Aufgabe 02a

$$(\lambda f \underbrace{x.fx}_{GV=\{x\}})(\underbrace{\lambda zy.xy}_{FV=\{x\}})x$$

$$\Rightarrow_\alpha (\lambda f \underbrace{x'.fx'}_{GV=\{x'\}})(\underbrace{\lambda zy.xy}_{FV=\{x\}})x$$

$$\Rightarrow_\beta (\lambda x'.\underbrace{(\lambda zy.xy)x'}_{GV=\{y,z\}}) \underbrace{x}_{FV=\{x\}}$$

$$\Rightarrow_\beta (\lambda z \underbrace{y.xy}_{GV=\{y\}}) \underbrace{x}_{FV=\{x\}}$$

$$\Rightarrow_\beta (\lambda y.xy)$$

Aufgabe 2b

```
g :: Int -> Int -> Int
g a 0 = a
g a b
  | b == 1 = g (a + 1) (b - 1)
  | otherwise = g (a + 2) (b - 2)
```

$$
\begin{aligned}
&\langle G\rangle = ((\lambda gxy.\langle ite\rangle(\langle iszero\rangle y)\\
&(\langle ite\rangle(\langle iszero\rangle(\langle pred\rangle y))\\
&(g(\langle succ\rangle x)(\langle pred\rangle y))\\
&(g(\langle succ\rangle(\langle succ\rangle x))(\langle pred\rangle(\langle pred\rangle y)))\\
&)\ )
\end{aligned}
$$