

b)

$$\frac{[x \leftarrow 2][P_3] \vdash d_4 \xrightarrow{*_d} P_4}{[x \leftarrow 2] \vdash P_3; d_4 \xrightarrow{*_d} P_3; P_4} \equiv \frac{[x \leftarrow 2, y \leftarrow 3] \vdash d_4 \xrightarrow{*_d} P_4}{[x \leftarrow 2] \vdash [y \leftarrow 3]; d_4 \xrightarrow{*_d} [y \leftarrow 3]; P_4} \quad D_5$$

$$\frac{\frac{[x \leftarrow 2, y \leftarrow 3] \vdash y+x \xrightarrow{*e} 5}{[x \leftarrow 2, y \leftarrow 3] \vdash \text{const } x:\text{int}=y+x \xrightarrow{*_d} [z \leftarrow 5]} \quad D_3}{[x \leftarrow 2] \vdash [y \leftarrow 3]; \text{const } z:\text{int}=y+x \xrightarrow{*_d} [y \leftarrow 3]; [z \leftarrow 5]} \quad D_5$$

c)

$$[x \leftarrow 2] \vdash P_3; P_4 \xrightarrow{*_d} P_3[P_4] \quad D_6$$