

$$\begin{aligned}
f(\lambda) &= c_B^t (A_B + \lambda D_B)^{-1} b \\
&= c_B^t (A_B (I + \lambda A_B^{-1} D_B))^{-1} b \\
&= c_B^t (I + \lambda A_B^{-1} D_B)^{-1} A_B^{-1} b \\
&= c_B^t (I + \lambda A_B^{-1} D_B)^{-1} x_B^*
\end{aligned}$$