$$
\begin{aligned}
& \arg\min_x \frac{1}{2}(y-x)^2 + \frac{\lambda}{2}x^T D^T D x \\
= \quad & \arg\min_x \frac{1}{2}x^T(I\lambda + D^T D)x - x^T y \\
= \quad & \arg\min_x \frac{1}{2}(x-(I\lambda + D^T D)^{-1}y)^T(I\lambda + D^T D)(x-(I\lambda + D^T D)^{-1}y) \\
= \quad & (I\lambda + D^T D)^{-1}y \qquad (1)
\end{aligned}
$$