

Hint: $(x^T x + \lambda I_D)^{-1} x^T = x^T (x x^T + \lambda I_N)^{-1}$

call: $(x^T x + \lambda I_D)^{-1} = C^{-1}$ & $(x x^T + \lambda I_N)^{-1} = D^{-1}$

Equation becomes; $C^{-1} x^T = x^T D^{-1}$ ①

By matrix multiplication of ① with C and D we get;

$$x^T D = C x^T \quad \text{②}$$

We can write the equations (2) and (4) in the homework sheet as;

$$\hat{\beta} y^T = C^{-1} x^T \quad \text{③} \quad \text{and} \quad x^T \hat{\alpha} y^{-1} = x^T D^{-1} \quad \text{④}$$

We know from the given hint that;

$$\hat{\beta} y^{-1} = x^T \hat{\alpha} y^{-1} \quad \text{⑤}$$

By multiplying ⑤ with y , we get; $\boxed{\hat{\beta} = x^T \hat{\alpha}}$

Alternative: $\hat{\beta} = C^{-1} x^T y$ where $C^{-1} x^T = x^T D^{-1}$. Therefore;

$$\hat{\beta} = x^T D^{-1} y \quad \text{⑥} \quad \text{where} \quad D^{-1} y = \hat{\alpha}. \quad \text{Thus; } \boxed{\hat{\beta} = x^T \hat{\alpha}}$$