

Derive the following expansion $J(\mathbf{m}; \mathcal{D})$

Figure out each derivation step, given the provided justification

Justification

$$J(\mathbf{m}; \mathbf{x}, \mathbf{y}) = \frac{1}{N} \|\mathbf{y} - m\mathbf{x}\|_2^2$$

=

$$\|\mathbf{z}\|_2^2 = \mathbf{z}^T \mathbf{z}$$

=

$$(\mathbf{A} + \mathbf{B})^T = \mathbf{A}^T + \mathbf{B}^T$$

=

$$(\mathbf{A} + \mathbf{B})\mathbf{C} = \mathbf{A}\mathbf{C} + \mathbf{B}\mathbf{C} \text{ and} \\ \mathbf{C}(\mathbf{A} + \mathbf{B}) = \mathbf{C}\mathbf{A} + \mathbf{C}\mathbf{B}$$

$$= \frac{1}{N} [\mathbf{y}^T \mathbf{y} - 2m\mathbf{y}^T \mathbf{x} + m^2 \mathbf{x}^T \mathbf{x}]$$

$$\mathbf{u}^T \mathbf{v} = \mathbf{v}^T \mathbf{u}$$
