

Extra exercises.

Compute the gradient of the following quality functions:

$$E(\mathbf{x}) = \langle \|\mathbf{x}\|^2 \mathbf{x}, \mathbf{y} - \mathbf{z} \rangle \text{ where } \mathbf{x}, \mathbf{y}, \mathbf{z} \in \mathbb{R}^{n \times 1}$$

$$E(\mathbf{x}) = \langle \mathbf{B}(\mathbf{x} - \mathbf{y}), \alpha \mathbf{C} \mathbf{x} \rangle \text{ where } \mathbf{x}, \mathbf{y}, \in \mathbb{R}^{n \times 1}, \mathbf{B}, \mathbf{C}, \in \mathbb{R}^{n \times n}, \alpha \in \mathbf{R}$$

$$E(\mathbf{x}) = \langle \mathbf{D}(\mathbf{x} + \mathbf{y}), \alpha \mathbf{x} \rangle + \|\mathbf{x} - \mathbf{y}\|^2 \text{ where } \mathbf{x}, \mathbf{y}, \in \mathbb{R}^{n \times 1}, \mathbf{D} \in \mathbb{R}^{n \times n}, \alpha \in \mathbf{R}$$

$$E(\mathbf{x}) = \|\mathbf{B}(\mathbf{x} - \mathbf{y})\|^2 \text{ where } \mathbf{x}, \mathbf{y}, \in \mathbb{R}^{n \times 1}, \mathbf{B} \in \mathbb{R}^{n \times n}$$

$$E(\mathbf{x}) = \langle \mathbf{B} \mathbf{y}, \mathbf{A} \mathbf{x} \rangle \text{ where } \mathbf{x}, \mathbf{y}, \in \mathbb{R}^{n \times 1}, \mathbf{A}, \mathbf{B} \in \mathbb{R}^{n \times n}$$

$$E(\mathbf{x}) = \langle \mathbf{A} \mathbf{x}, \mathbf{A} \mathbf{x} \rangle \text{ where } \mathbf{x}, \mathbf{y}, \in \mathbb{R}^{n \times 1}, \mathbf{A} \in \mathbb{R}^{n \times n}$$