

Assignment 1

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1 Answer 1

1.1 Part a

$$\mathbf{A} = (a_{ij})_{1 \leq i \leq n, 1 \leq j \leq n}$$

$$\vec{\mathbf{x}} = (x_i)_{1 \leq i \leq n}$$

$$\vec{\mathbf{y}} = A\vec{\mathbf{x}}$$

$$\vec{\mathbf{y}} = (y_i)_{1 \leq i \leq n}$$

$$y_i = \sum_{j=1}^n A_{ij}x_j$$

$$\frac{\partial y_i}{\partial x_j} = A_{ij}$$

$$\frac{d\vec{\mathbf{y}}}{d\vec{\mathbf{x}}} = A$$

1.2 Part b

$$y = \vec{\mathbf{x}}^T A \vec{\mathbf{x}}$$

$$y = \sum_{i=1}^n \sum_{j=1}^n x_i A_{ij} x_j$$

$$\frac{\partial y}{\partial x_k} = \sum_{0 \leq i \leq n} A_{ik} x_k + \sum_{0 \leq j \leq n} A_{kj} x_k$$

$$\frac{dy}{d\vec{\mathbf{x}}} = \vec{\mathbf{x}}^T (A + A^T)$$

2 Answer 2

$\mathbf{m} \times \mathbf{n} \times \mathbf{k}$ matrix of 3 dimensions

3 Answer 3

3.1 Part a

$$\begin{bmatrix} 4\sin(x)\cos(x)\cos(y) & -2\sin^2(x)\sin(y) \\ 2x + 3e^y & x^2 + 3e^y \end{bmatrix}$$

3.2 Part b

$$\begin{bmatrix} 6xy + yzw & 3x^2 + xzw & xyw & xyz \\ \cos(x^2 + yw - z)2x & \cos(x^2 + yw - z)w & -\cos(x^2 + yw - z) & \cos(x^2 + yw - z)y \end{bmatrix}$$

4 Answer 4

$$\beta = (\beta_i)_{1 \leq i \leq n}$$

$$\vec{\mathbf{x}} = (x_i)_{1 \leq i \leq n}$$

$$\beta^T \vec{x} = \sum_{i=1}^n \beta_i x_i$$

$$\frac{d(e^{\beta^T \vec{x}})}{d\vec{x}} = \beta^T e^{\beta^T \vec{x}}$$