

sem o diagonal! 1,6

① a) $y_i = ax_i + b$

$$\begin{cases} y_1 = ax_1 + b \\ y_2 = ax_2 + b \\ \vdots \\ y_N = ax_N + b \end{cases} \quad \begin{bmatrix} x_1 & 1 \\ x_2 & 1 \\ x_3 & 1 \\ \vdots & \vdots \\ x_N & 1 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_N \end{bmatrix}$$

A C

✓ -0,3

b) Equação normal $\Rightarrow AX = b \Rightarrow A^T A X = A^T b$

$$A^T A = \begin{bmatrix} x_1 & x_2 & \dots & x_N \\ 1 & 1 & \dots & 1 \end{bmatrix} \begin{bmatrix} x_1 & 1 \\ x_2 & 1 \\ \vdots & \vdots \\ x_N & 1 \end{bmatrix} = \begin{bmatrix} \sum x_i^2 & \sum x_i \\ \sum x_i & n \end{bmatrix}$$

$$A^T b = \begin{bmatrix} x_1 & x_2 & \dots & x_N \\ 1 & 1 & \dots & 1 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix} = \begin{bmatrix} \sum x_i y_i \\ \sum y_i \end{bmatrix}$$

✓ -0,3

③ $[(1-t)p + tq]^2 \leq (1-t)p^2 + tq^2$

$$p^2(t^2 - 2t + 1) - 2pq(t^2 - t) + t^2q^2 + (1-t)p^2 - q^2t \leq 0$$

$$p^2(t^2 - t) - 2pq(t^2 - t) + q^2(t^2 - t) \leq 0$$

$$(t^2 - t)(p^2 - 2pq + q^2) \leq 0$$

$$(t^2 - t)(p - q)^2 \leq 0$$

$$\left. \begin{array}{cc} \downarrow & \downarrow \\ \leq 0 & \geq 0 \end{array} \right\} f(x) \text{ é convexa}$$

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✓ -0,5

$$5.8) g(w) = \frac{1}{p} \sum_{i=1}^p |x_i^T w - y_i|$$

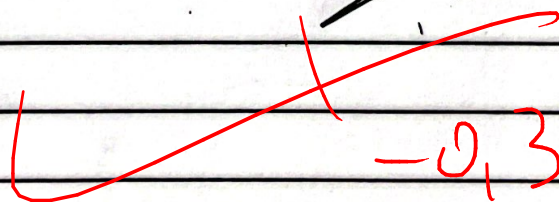
Desigualdade Triangular: $|a+b| \leq |a| + |b|$

$$\lambda g(w_1) + (1-\lambda)g(w_2) = \frac{1}{p} \sum | \lambda x_i w_1 - y_i | + \frac{1}{p} \sum | (1-\lambda) x_i w_2 - (1-\lambda) y_i |$$

(Pela desigualdade) $\geq \frac{1}{p} \sum | x_i [\lambda w_1 + (1-\lambda) w_2] - \cancel{\lambda y_i} - \cancel{y_i} + \cancel{\lambda y_i} |$

$$= \frac{1}{p} \sum | x_i [\lambda w_1 + (1-\lambda) w_2] - y_i |$$

$$= g(\lambda w_1 + (1-\lambda) w_2)$$

 -0,3

Isso é um curso do departamento de Matemática, sem pressões, justifique