SOLUCIÓN A:

$$\hat{x} = \underset{x}{\operatorname{argmin}} \| \underline{A}\underline{x} - \underline{b} \|$$

$\underline{A}$: $M \times N$ con $M \gtrless N$*

$\underline{x}$: $N \times 1$

$\underline{b}$: $M \times 1$

$$J(\underline{x}) = \frac{1}{2}(Ax-b)^T(Ax-b)$$

$$= \frac{1}{2}(x^TA^T - b^T)(Ax-b)$$

$$= \frac{1}{2}(x^TA^TAx - x^TA^Tb - b^TAx + b^Tb)$$

REPASO:

$$\frac{\partial}{\partial x}(x^TSx) = 2Sx \qquad \frac{\partial}{\partial x}(x^Ta) = a \qquad \frac{\partial}{\partial x}(a^Tx) = a^T$$

$$\frac{\partial J}{\partial x} = \frac{1}{2}\left(2A^TAx - A^Tb - (b^TA)^T\right) = A^TAx - A^Tb \overset{!}{=} 0$$

$$\Rightarrow \boxed{\hat{x} = [A^TA]^{-1}A^Tb}$$

$\rightarrow$ Matlab: $x = A \backslash b;$

* si $M=N \Rightarrow \hat{x} = \underline{A}^{-1}\underline{b}$; si $M<N$ no hay solu.