Homework Assignment

Your Name

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Problem 1.a

$f^{-1}(C) = \{x \in A \mid f(x) \in C\}$
since ϕ represents an empty set, we need to find
$X^{-1}(\phi) = \{A \in \Omega \mid X(A) \in \phi\}$
As an empty set holds no value, there doesnt exist any $X(A) \in \phi$ and hence no such A exists. So,
$X^{-1}(\phi) = \phi$

Problem 1.b

Since $X : \Omega \to \mathbb{R}$,
$X(A) \in \mathbb{R} \forall A \in \Omega$
So, $X^{-1}(\mathbb{R}) = \Omega$

Problem 2

Support of X is given by $\{x \in \mathbb{R} | F_X(x) > 0\}$
So, $F_X(x) > 0 \implies 1 - e^{-\lambda x} > 0 \implies e^{\lambda x} > 1 \implies x > 0$

Problem 3

$L = \sum(mx + c - y)/N$
for minimum value of loss function, $\frac{\partial L}{\partial m} = 0$ and $\frac{\partial L}{\partial c} = 0$
$\frac{\partial L}{\partial m} = \frac{\sum x(mx+c-y)}{N} = \frac{\sum mx^2+cx-yx}{N} = \frac{mS_{x^2}+cSx-S_{xy}}{N} = 0$
Similarly $\frac{\partial L}{\partial c} = \frac{mS_x+c-S_y}{N} = 0$
So, $c = \frac{S_y - mS_x}{N} \implies m = \frac{NS_{xy}-S_xS_y}{NS_{x^2}-S_x^2}$ *and* $c = \frac{S_yS_{x^2}-S_xS_{xy}}{NS_{x^2}-S_x^2}$