Problem 1

Problem 2

$P(X > 3.0)$ can be easily derived by integrating the density function over all $X > 3.0$.

$$\begin{aligned} P(X > 3.0) &= \int_{3}^{\inf} \frac{1}{t} dt \\ &= -\frac{1}{t} \end{aligned}$$

Problem 3

There were two steps involved in proving $Cov(V) = c^2(A'A)^{-1}$.

First, simplify V:

$$\begin{aligned} V &= (A'A)^{-1}A'U \\ &= A^{-1}A'^{-1}A'U \\ &= A^{-1}U \end{aligned}$$

Next, plug the simplified V into the $Cov(V)$ formula:

$$\begin{aligned} Cov(V) &= Cov(A^{-1}U) \\ &= A^{-1}Cov(U)A'^{-1} \\ &= A^{-1}(c^2I)A'^{-1} \\ &= c^2A^{-1}IA'^{-1} \\ &= c^2A^{-1}A'^{-1} \\ &= c^2(A'A)^{-1} \end{aligned}$$