Information and Communication Theory

Problem Set 4 - Solutions

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1. $h(X) = log(\frac{e}{\lambda})$ bits
2. $h(X) = log(\frac{2e}{\lambda})$ bits
3. $I(X;Y) = 1$
4. $I(X;Y) = log(3) - \frac{2}{3}$
5.
6.
7. $I(X;Y) = \frac{1}{2} log(1 + \frac{\tau^2}{\sigma^2})$

   If the noise's variance σ^2 tends to 0, $I(X;Y)$ tens to $+\infty$. If the noise's variance σ^2 tends to $+\infty$, $I(X;Y)$ tens to 0.
8. $h(X) = \frac{1-a}{2} log(\frac{2}{1-a}) + \frac{1+a}{2} log(\frac{2}{1+a})$
9. $I(X, Y_1) = +\infty$, $I(X, Y_2) = 1$, $I(X; Y_1, Y_2) = +\infty$