

Corollary 8.19 If $R_I(0) > 0$, then $R_I(D)$ is strictly decreasing for $0 \leq D \leq D_{max}$, and the inequality constraint in the definition of $R_I(D)$ can be replaced by an equality constraint.

Remark In all problems of interest,

$$R(0) = R_I(0) > 0.$$

Otherwise, $R(D) = 0$ for all $D \geq 0$ because $R(D)$ is nonnegative and non-increasing. Therefore,

$$R_I(D) = \min_{\hat{X}: Ed(X, \hat{X}) = D} I(X; \hat{X}).$$