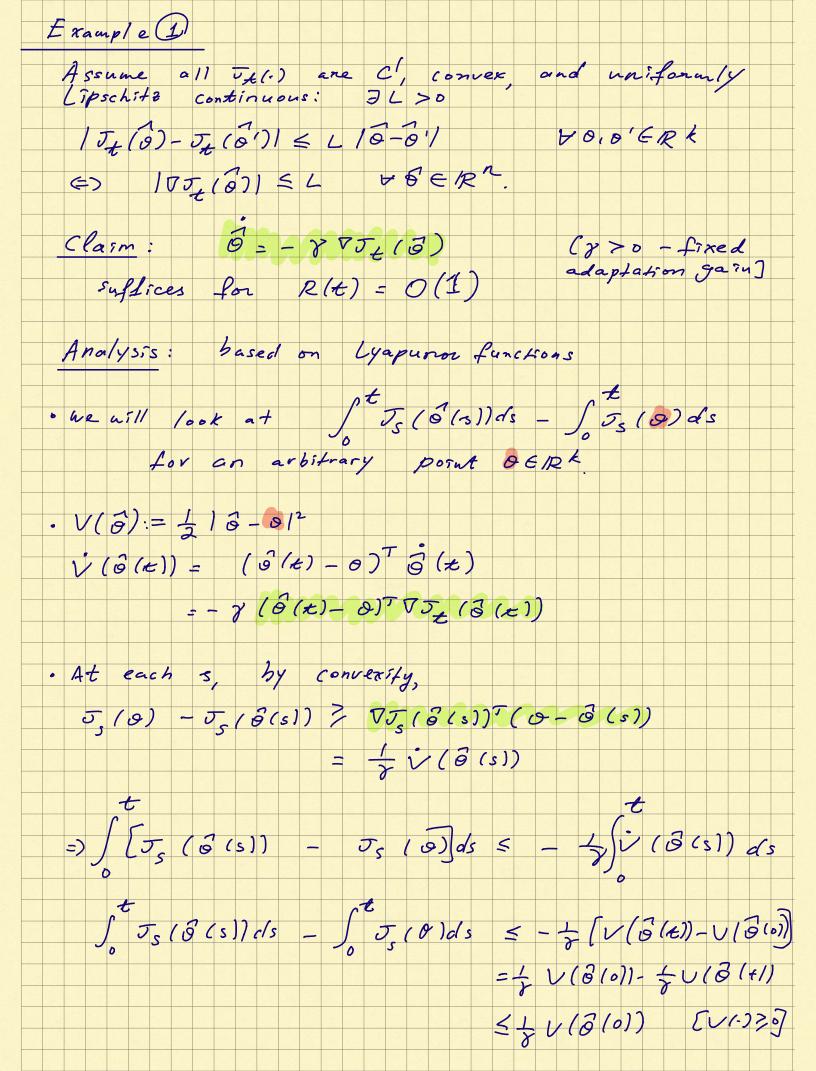
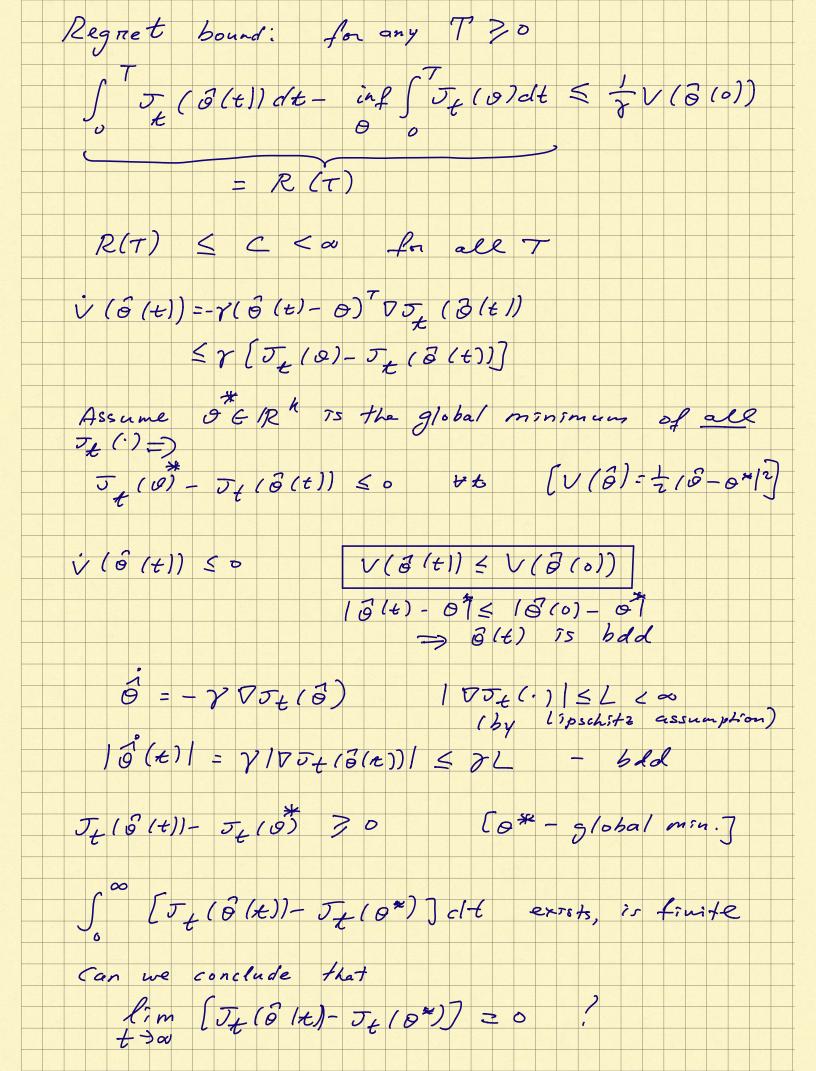
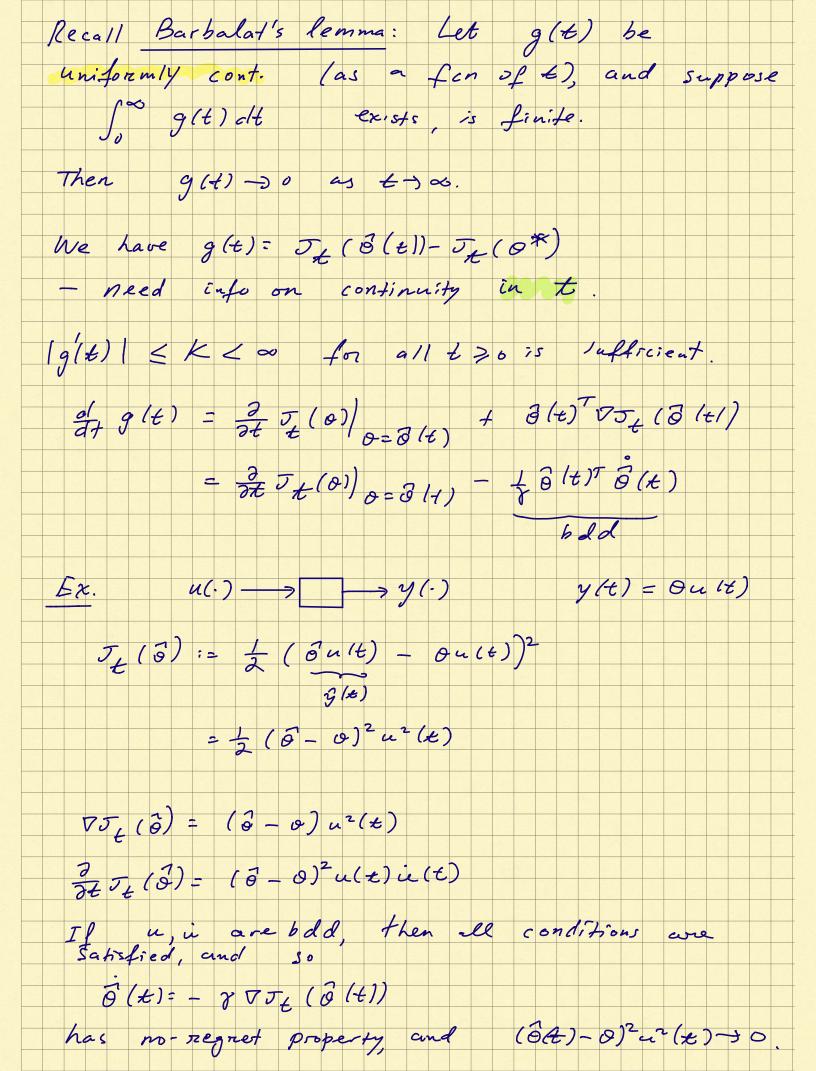


Integrated prediction error.  $\vec{o} \in \mathbb{R}^k$   $\longrightarrow$   $\int \vec{J} (\vec{o}) ds$ (k-parameter  $\vec{o}$   $\vec{J} (\vec{o}) ds$ An estimation stategy - law for updating O(t):  $\int_{0}^{t} J_{s}(\hat{\Theta}(s)) ds \qquad \overline{\Theta}(s) \leftarrow u_{to,sJ,} J_{tv,sJ}$  Regret at time t:  $P(t) := \int_{0}^{t} \overline{J}_{s}(\overline{\Theta}(s)) ds - \min_{\overline{\Theta} \in \mathbb{R}^{k}} \int_{0}^{t} \overline{J}_{s}(\overline{\Theta}) ds - \min_{\overline{\Theta} \in \mathbb{R}^{k}} \int_{0}^{t} \overline{J}_{s}(\overline{\Theta}) ds - \operatorname{clepends} \int_{0}^{t} \operatorname{clepends}$ Goal: 1 R(t) -> 0 as t>0 Online Optimization (in cont. time) is small [o(t)] This is possible with simple gradient descent rules, under some cassumptions on J. (.) for - (e t 20.







 $\hat{\theta}(t)$  does not necessarily converse to  $\hat{O}_{i}$  we will need more conditions on a [Persistent Excitation property].