Homework 1

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Question 1. Re-Generate Example Results

Solution. We re-generated the results of the example 2.1-2. In fig. **??**, **??** are presented respectively the optimal state trajectory and the optimal control of the scalar plant $x_{k+1} = ax_k + bu_k$ for several weighting factors r and initial state $x_0 = 1$. While in fig. **??**, **??** the same plots are depicted but for initial state $x_0 = 0$.

Then, we re-generated the results of the example 2.4-1. In figures **??**, **??** are presented respectively the optimal & suboptimal feedback gains and the performance index response of the scalar plant $x_{k+1} = ax_k + bu_k$ with performance index $J_0 = \frac{1}{2}s_N x_N + \frac{1}{2}\sum_{k=0}^{N-1}(qx_k^2 + ru_k^2)$.

Finally, we re-generated the response of the F-16 autpilot as depicted in figure **??**. It is noticed that our response signals has steps and they are not following a smooth curvature. Since we studied discrete-time systems these results were expected to present steps.

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