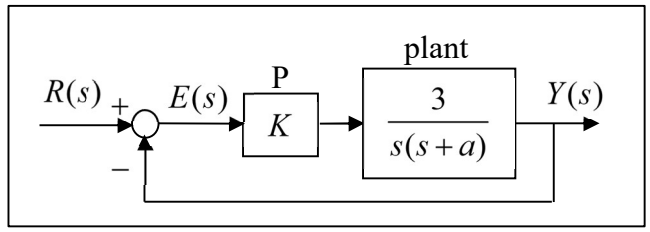
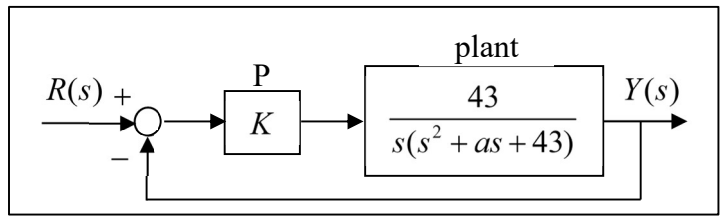
Introductory Control Systems
Exercises #7 – Parametric Sensitivity

1. A ***proportional*** ("P") controller is used to control a ***2nd order*** plant as shown. The system input is $R(s)$ and the system output is $Y(s)$. Find S_a^T and S_K^T the ***sensitivities*** of the ***closed-loop transfer function*** $T(s)=\frac{Y}{R}(s)$ to changes in parameters a and K.



Answers: $\boxed{S_a^T=\frac{-as}{s^2+as+3K}}$ $\boxed{S_K^T=\frac{s^2+as}{s^2+as+3K}}$

2. A ***proportional*** ("P") controller is used to control a ***3rd order*** plant as shown. The system has one input $(R(s))$ and one output $(Y(s))$. Find S_a^T the sensitivity of the closed loop transfer function $T(s)=\frac{Y}{R}(s)$ to changes in the parameter a.



Answer: $\boxed{S_a^T=\frac{-as^2}{s^3+as^2+43s+43K}}$