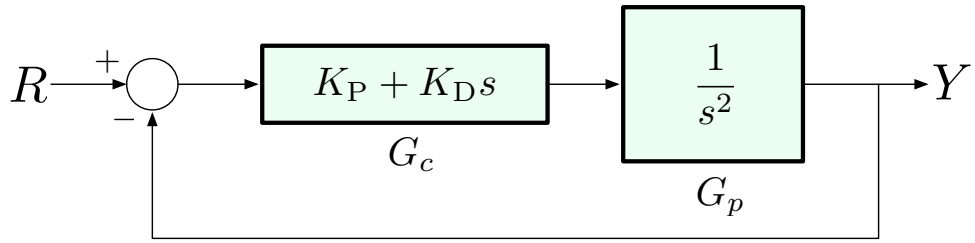
Double Integrator with PD-Control



Characteristic equation: $1 + \underbrace{(K_\mathrm{P} + K_\mathrm{D} s)}_{G_c(s)} \cdot \underbrace{\frac{1}{s^2}}_{G_p(s)} = 0$

$$s^2 + K_\mathrm{D} s + K_\mathrm{P} = 0$$

To use the RL method, we need to convert it into the Evans form $1 + KL(s) = 0$, where $L(s) = \dfrac{b(s)}{a(s)} = \dfrac{s^m + b_1 s^{m-1} + \ldots}{s^n + a_1 s^{n-1} + \ldots}$

$$1 + (K_\mathrm{P} + K_\mathrm{D} s)\frac{1}{s^2} = 1 + K_\mathrm{D} \cdot \frac{s + K_\mathrm{P}/K_\mathrm{D}}{s^2}$$

$$\Longrightarrow \; K = K_\mathrm{D}, \;\; L(s) = \frac{s + K_\mathrm{P}/K_\mathrm{D}}{s^2} \qquad \text{(assume } K_\mathrm{P}/K_\mathrm{D} \text{ fixed, } = 1)$$