

$y'(t) + \frac{B}{n} y(t) = \frac{1}{n} u(t)$
 $sY(s) + \frac{B}{n} Y(s) = \frac{1}{n} U(s)$
 $H(s) = \frac{Y(s)}{U(s)} = \frac{1}{s + \frac{B}{n}}$

$y(t) = (u * h)(t) = \int_0^t h(\tau) u(t-\tau) d\tau$
 $Y(s) = U(s) \cdot H(s)$
 $\mathcal{L}(y(t)) = \int_0^\infty y(t) e^{-st} dt = \frac{N(s)}{D(s)}$

$\mathcal{L}(y'(t)) = s \mathcal{L}(y(t)) - y(0)$

LTI System
 input-response

The Promotion MDP

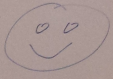
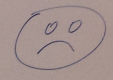
$P(j | s, a) \equiv \mathbb{P}(\text{going to state } j \mid \text{you are in state } s \text{ and you chose action } a)$

$q \in (0, 1)$

States $s \in \mathcal{S} = \{(l, r, a)\}$
 ↑ ↑ ↑
 level time in allowed
 level level tasks

$P((l, r+1, 1) | (l, r, a), w) = 1$
 ↑
 "wait"

$P(s | (l, r, 1), a) = \begin{cases} 1 - q^r & \text{if } s = (l+1, 0, 0) \\ q^r & \text{if } s = (l, r+1, 0) \\ 0 & \text{otherwise} \end{cases}$

Objective 1 $\beta \in (0, 1]$
 Discount Factor

$\text{Max } \mathbb{E} \sum_{t=0}^{\infty} \beta^t L_t$

Objective 2:

$\text{Max } \mathbb{E} \sum_{t=0}^{\infty} \beta^t \mathbb{1}_{\{L_t = 3\}}$