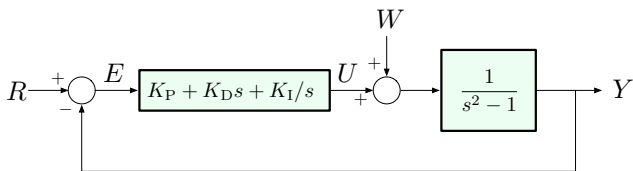


Proportional-Integral-Derivative (PID) Control



$$Y = \frac{K_D s^2 + K_P s + K_I}{s^3 + K_D s^2 + (K_P - 1)s + K_I} R + \frac{s}{s^3 + K_D s^2 + (K_P - 1)s + K_I} W$$

Stability:

- ▶ need $K_D > 0$, $K_P > 1$, $K_I > 0$ (necessary condition) and $K_D(K_P - 1) > K_I$ (Routh–Hurwitz for 3rd-order)
- ▶ can still assign coefficients arbitrarily by choosing K_P, K_I, K_D