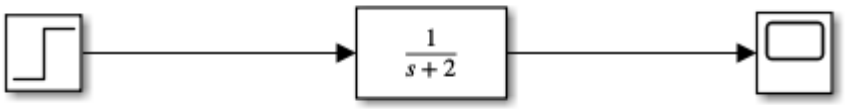
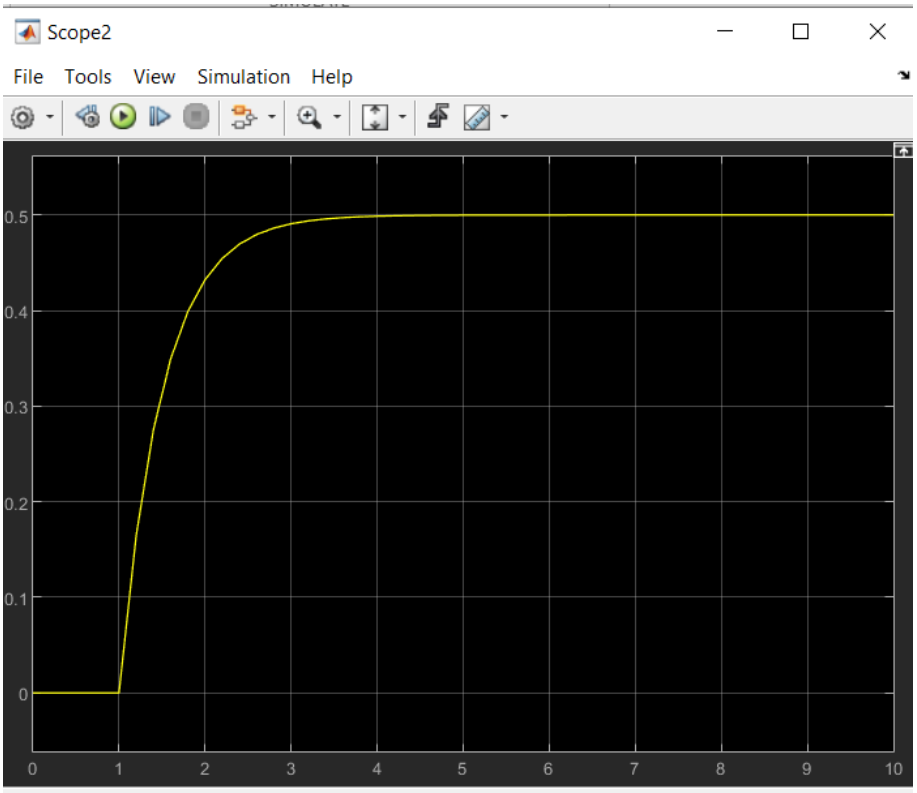
Introduction to First-Order and Second-Order Systems

Part 1: First-Order System

The general first-order transfer function is:

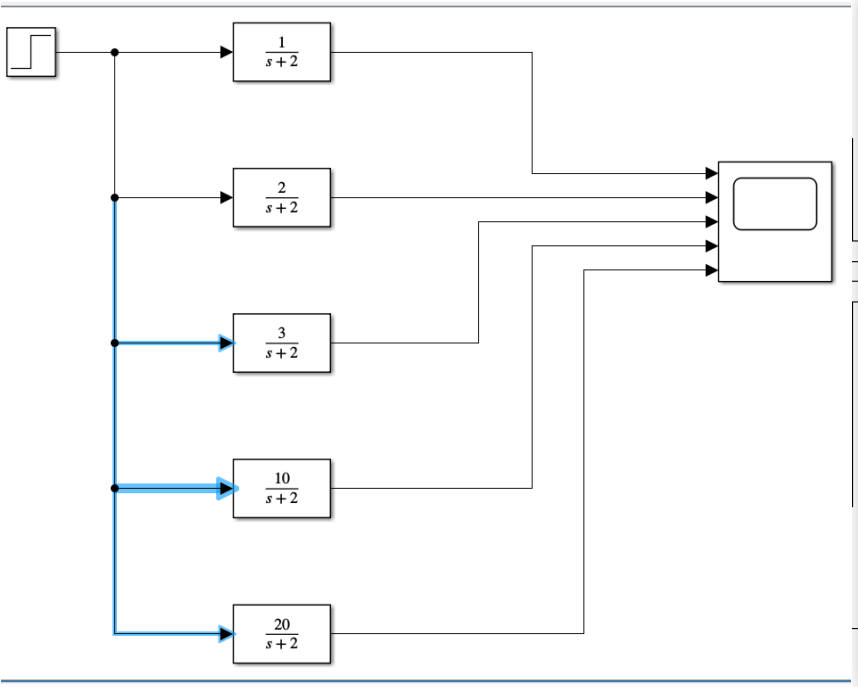
$$G(s) = \frac{K}{\tau s + 1}$$

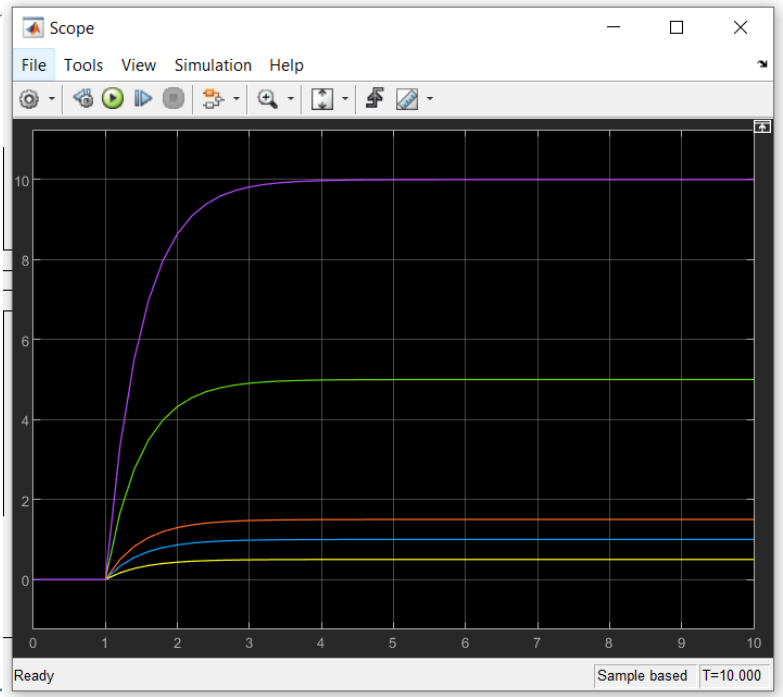




Effect of gain

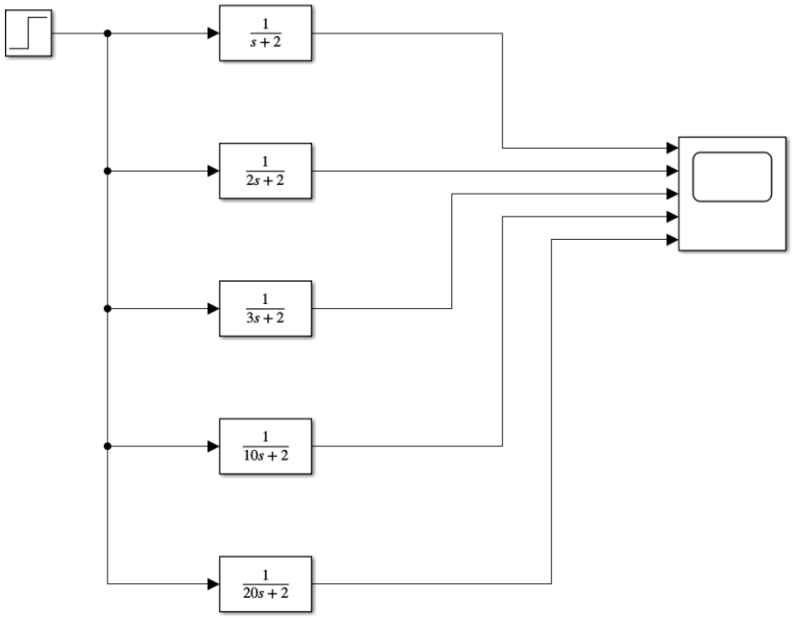
- The gain of the system affects the output of the system.

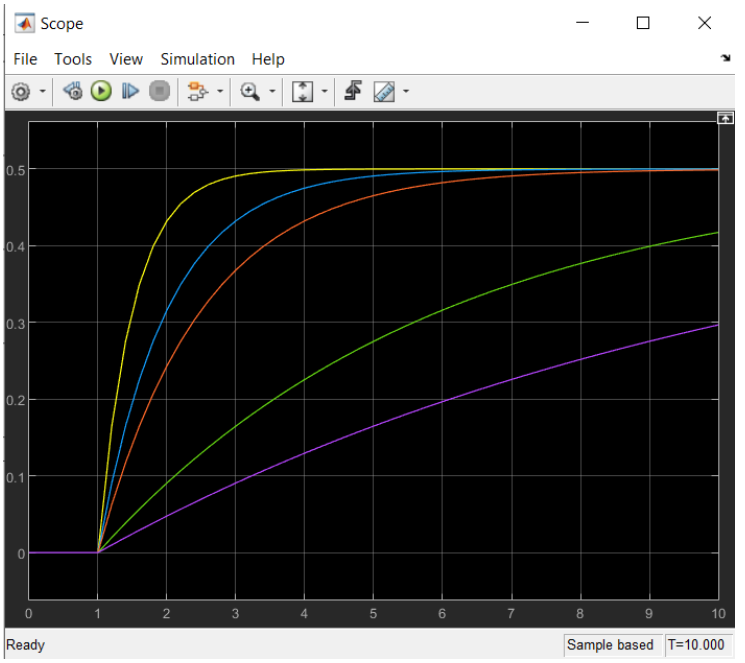




Effect of Time constant

- The time constant of the system affects the response system.

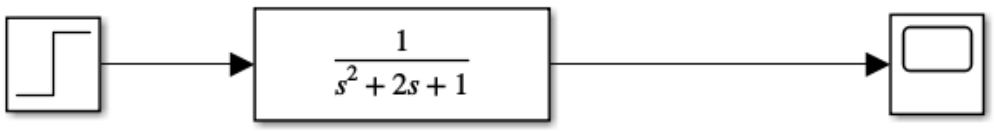


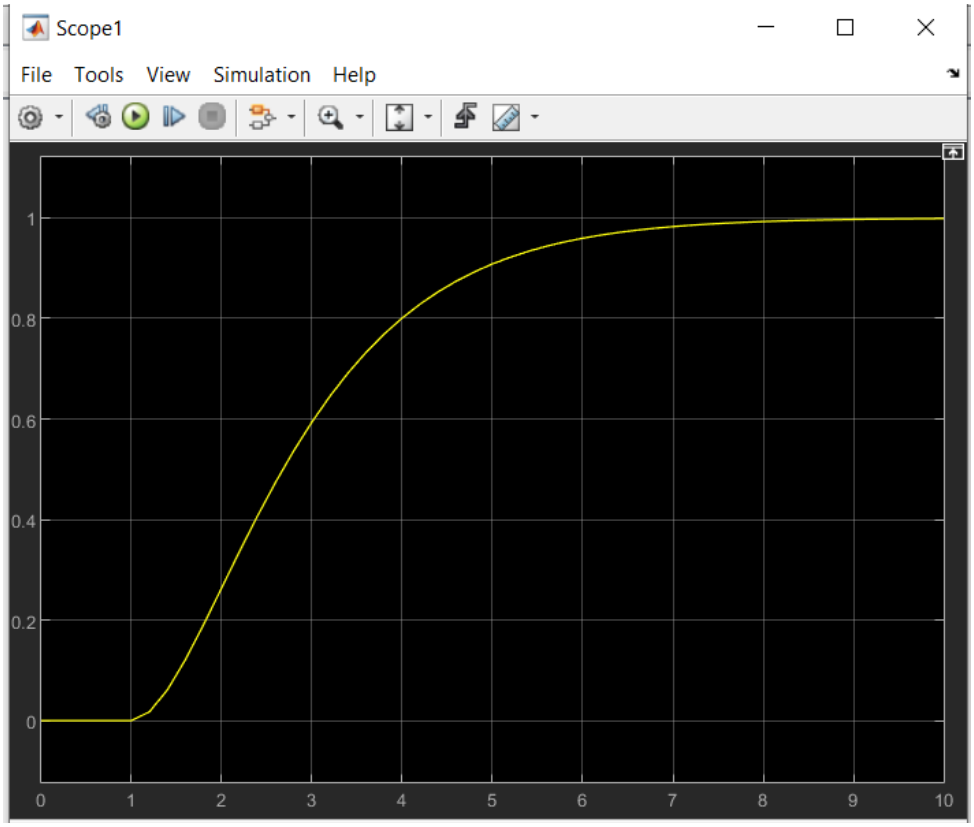


Second order System:

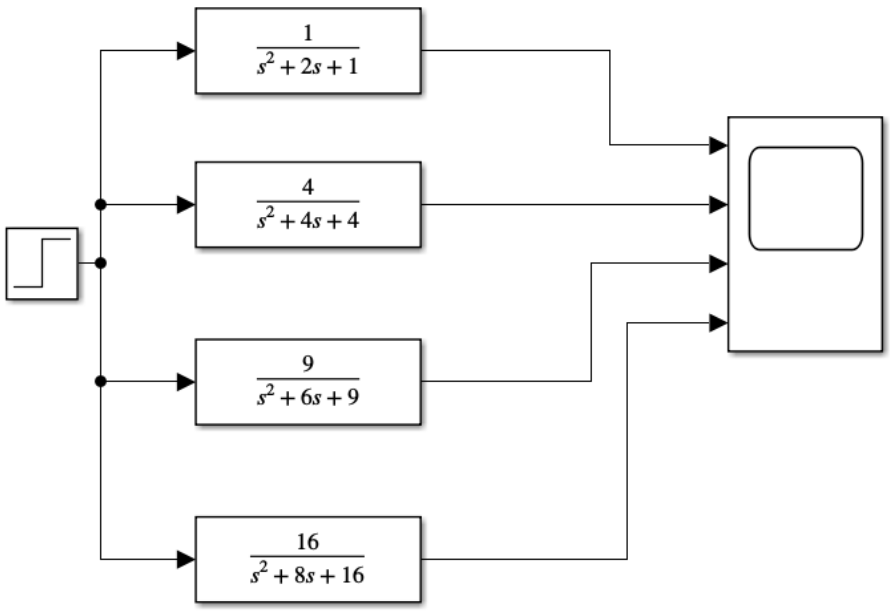
The general second-order transfer function is:

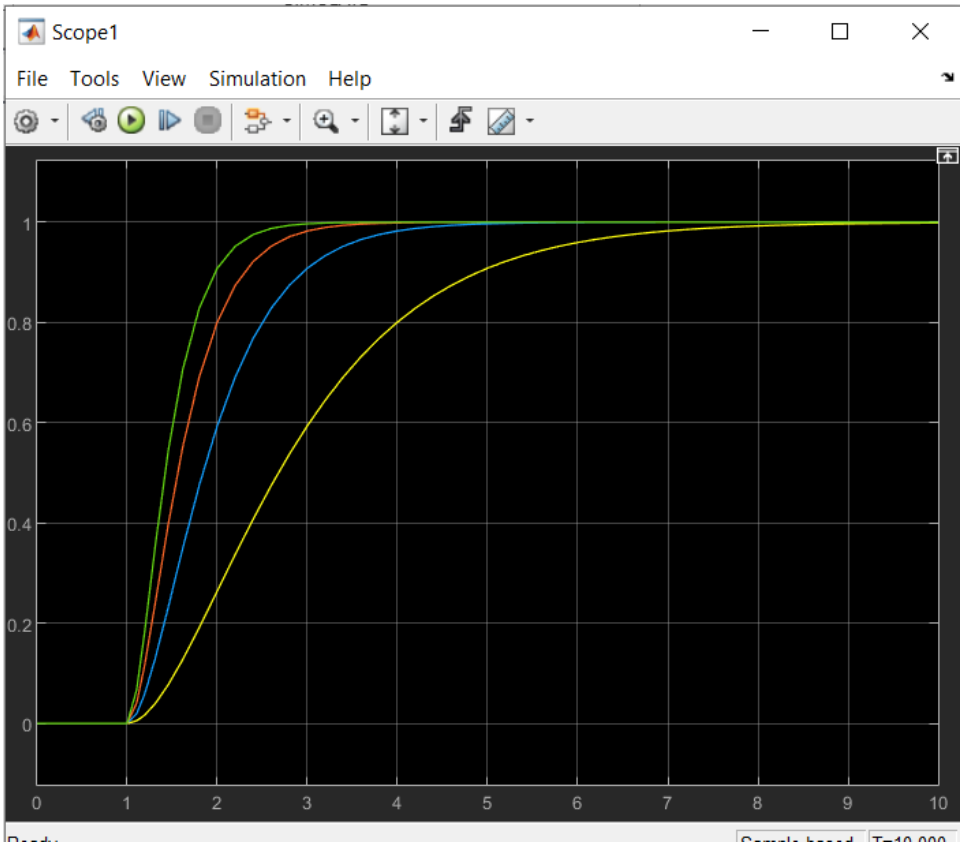
$$G(s) = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$



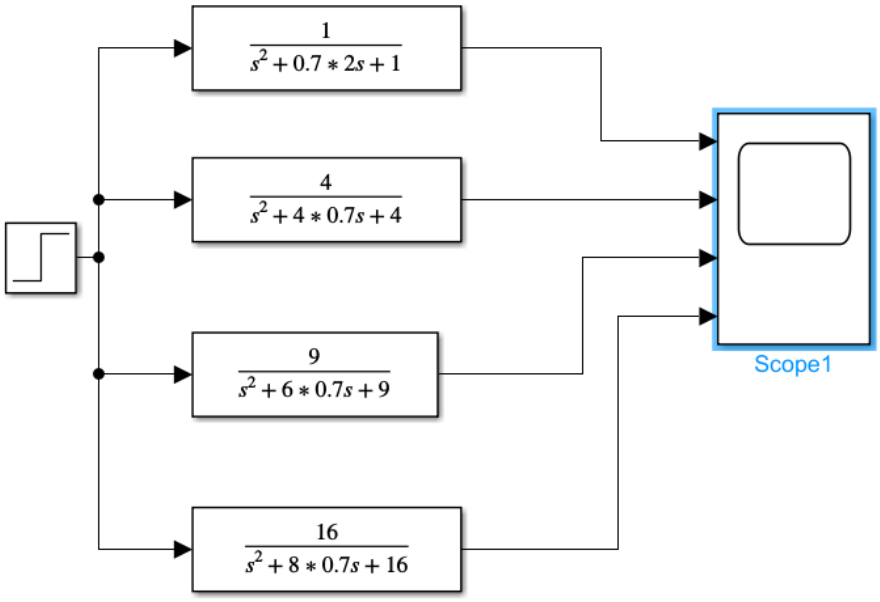


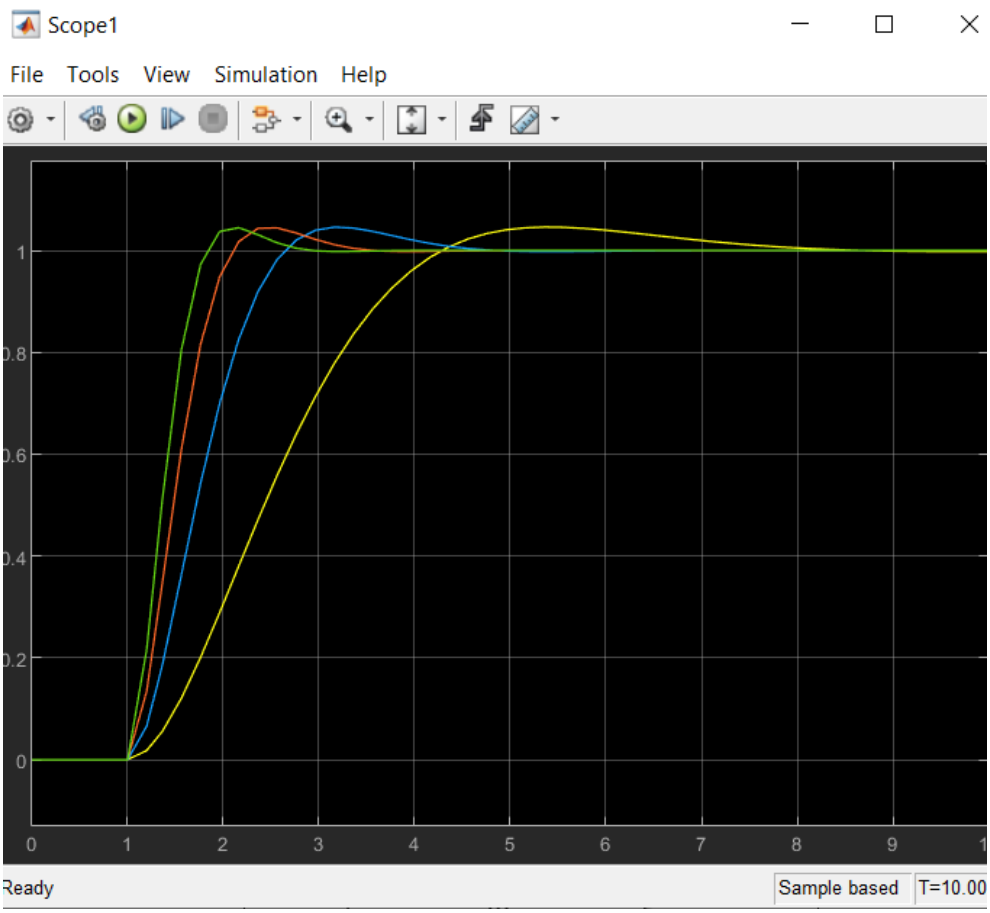
Effect of natural frequency on critically damped system:





Effect of natural frequency on underdamped system:





Effect of damping ratio: