

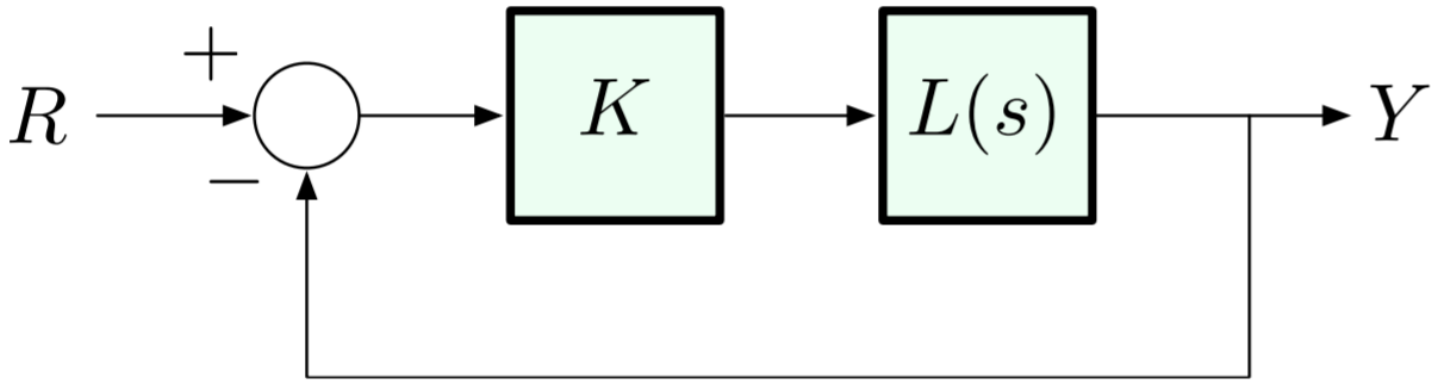
# **ECE 486: Control Systems**

Lecture 11A: Introduction to Root Locus Method

# Problem 1

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Suppose  $L = \frac{1}{s^2 + 2s}$ .



- Solve the closed-loop poles as a function of  $K$ .
- Draw the root locus.
- Is it possible to select  $K$  to achieve settling time  $\leq 3s$ ?

# Solution 1A

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- Solve the closed-loop poles as a function of K

$$L = \frac{1}{s^2 + 2s}$$

# Solution 1B

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- Draw the root locus.

$$L = \frac{1}{s^2 + 2s}$$

# Solution 1C

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- Is it possible to select  $K$  to achieve settling time  $\leq 3$  seconds?

$$L = \frac{1}{s^2 + 2s}$$

# Solution 1-Extra Space

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# **ECE 486: Control Systems**

## Lecture 11B: Root Locus Rules ABC

## Problem 2

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Consider the following functions.

$$L = \frac{1}{s^2 + 2s + 10},$$

$$L = \frac{s-3}{s^2 + 2s + 10},$$

$$L = \frac{s+4}{s^5 + 1}$$

How many branches are there in the root locus? What are the starting and ending points? Justify your answers using Matlab.



## Problem 2A

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Consider the following functions.

$$L = \frac{1}{s^2 + 2s + 10}$$

How many branches are there in the root locus? What are the starting and ending points? Justify your answers using Matlab.

## Problem 2B

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Consider the following functions.

$$L = \frac{s - 3}{s^2 + 2s + 10}$$

How many branches are there in the root locus? What are the starting and ending points? Justify your answers using Matlab.

## Problem 2C

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Consider the following functions.

$$L = \frac{s + 4}{s^5 + 1}$$

How many branches are there in the root locus? What are the starting and ending points? Justify your answers using Matlab.

# Solution 2-Extra Space

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