EENG307: Nyquist Stability Analysis[1]

Lecture 29

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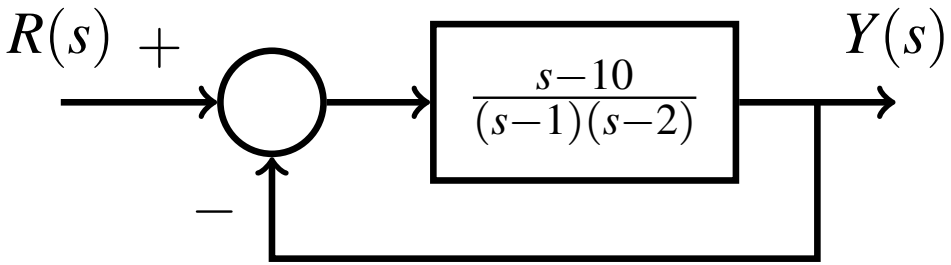
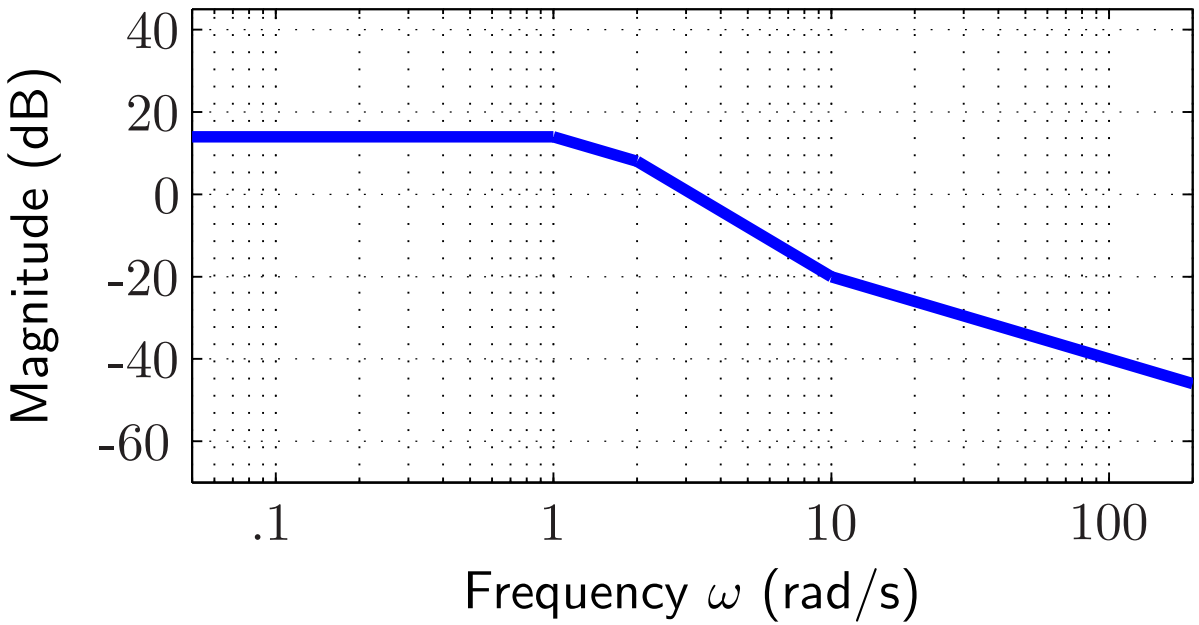
[2] Developed and edited by Tyrone Vincent and Kathryn Johnson, Colorado School of Mines, with contributions from Salman Mohagheghi, Chris Coulston, Kevin Moore, CSM and Matt Kupilik, University of Alaska, Anchorage

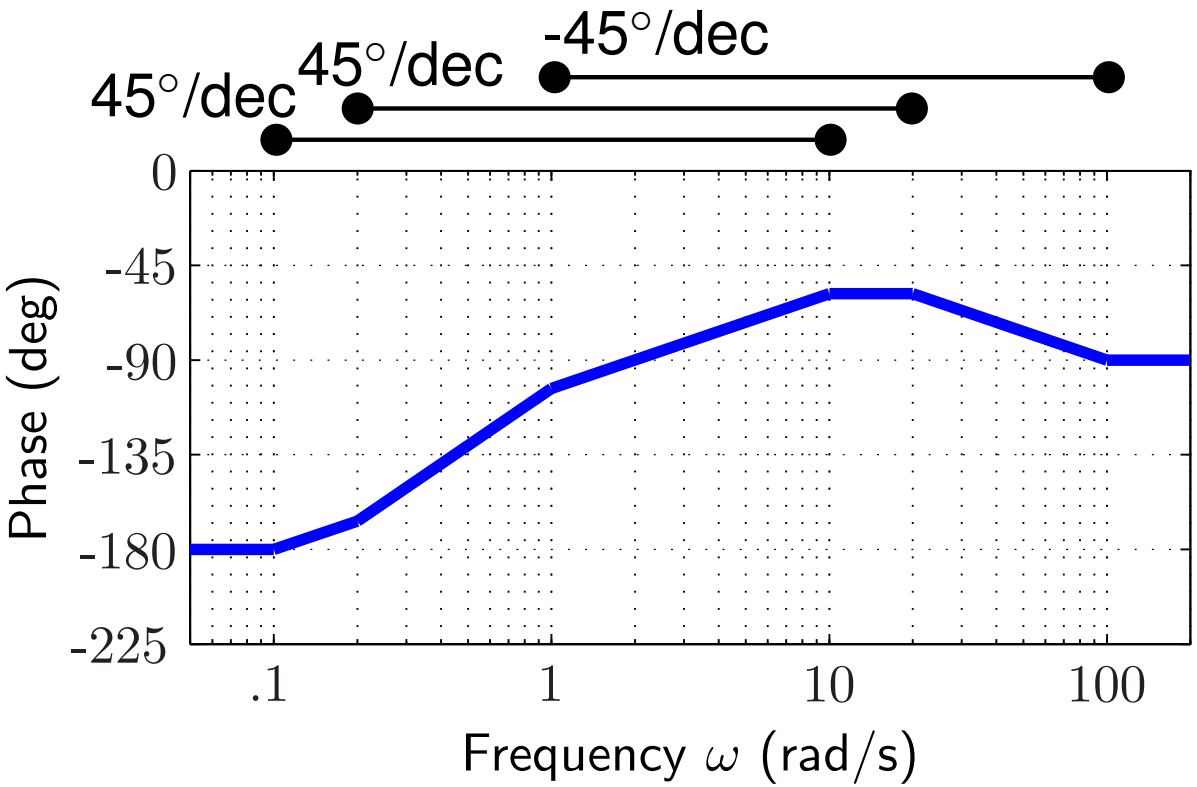
Example System



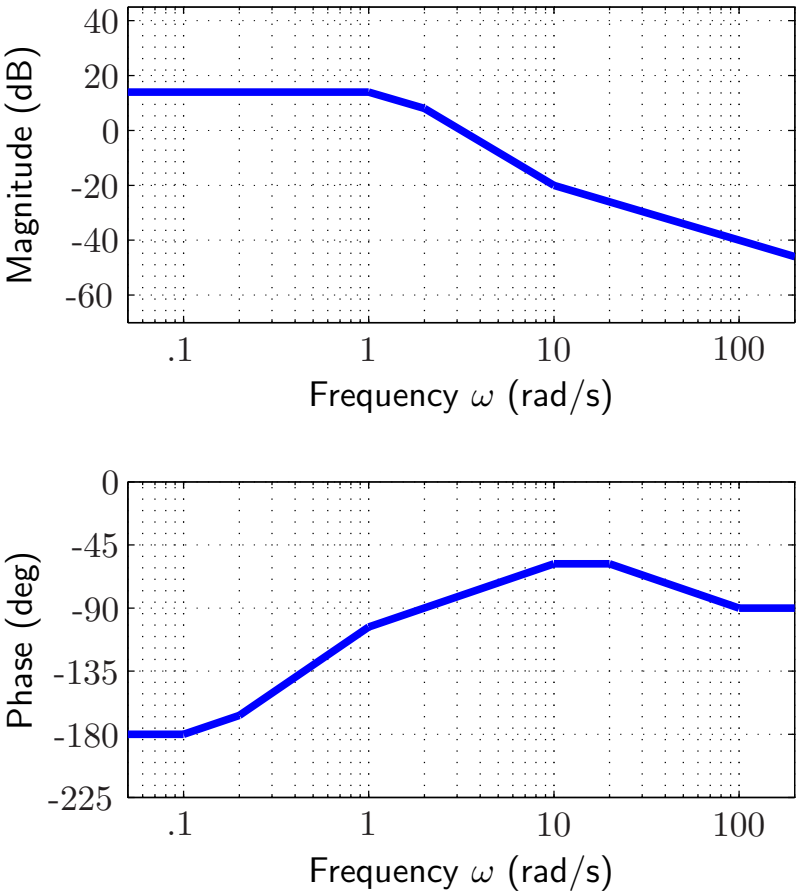
Magnitude Plot



Phase Plot


45°/dec
45°/dec
-45°/dec
0
-45
-90
-135
-180
-225
Phase (deg)
.1
1
10
100
Frequency ω (rad/s)

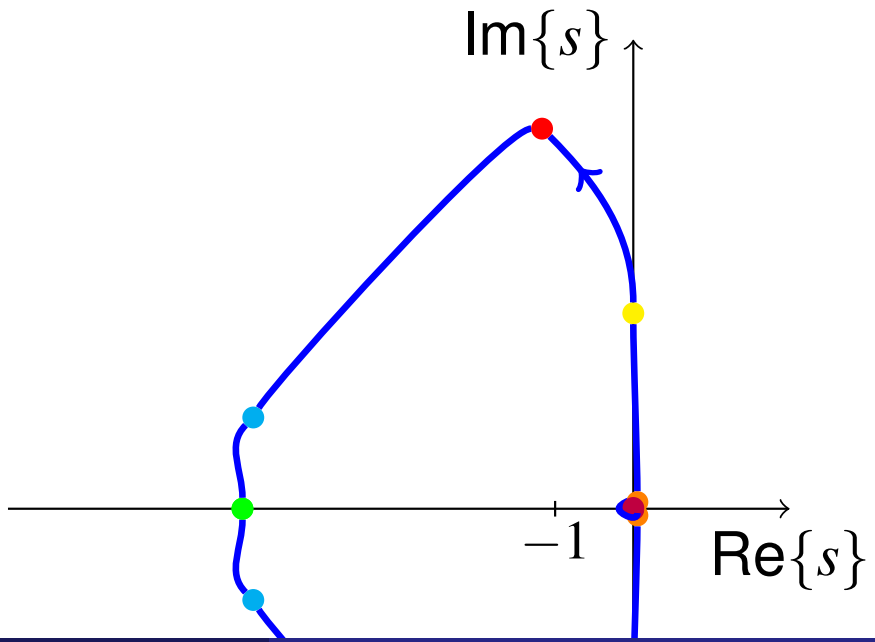
Magnitude and Phase Table



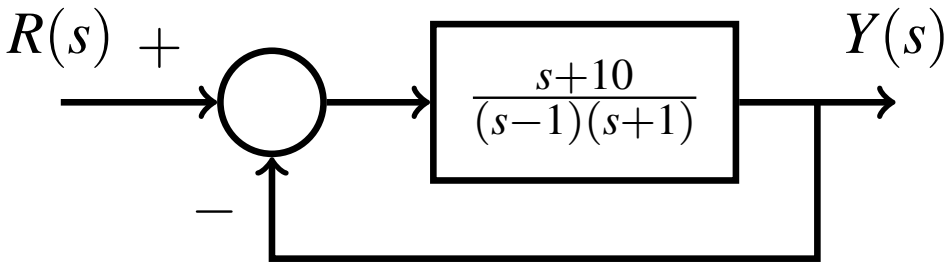
Freq (rad/s)	Mag (dB)	Mag	Phase
.1	14	5	-180°
.2	14	5	-166.5°
1	14	5	-103.5°
2	8	2.5	-90°
10	-20	0.1	-58.5°
100	-40	0.01	-90°

Draw Nyquist Plot

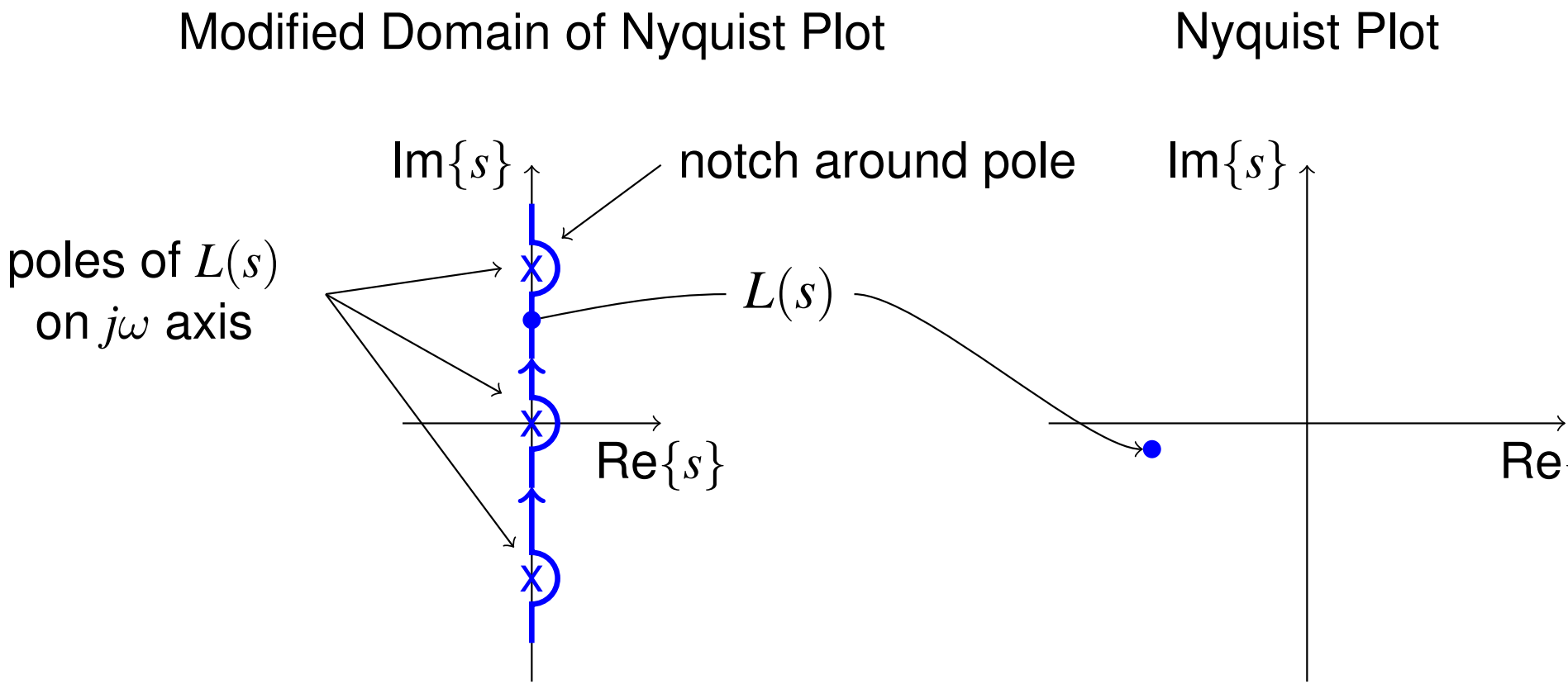
Freq (rad/s)	Mag (dB)	Mag	Phase
.1	14	5	-180°
.2	14	5	-166.5°
1	14	5	-103.5°
2	8	2.5	-90°
10	-20	0.1	-58.5°
100	-40	0.01	-90°

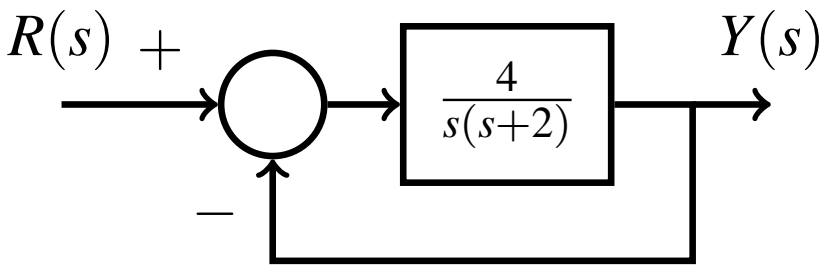


Example System

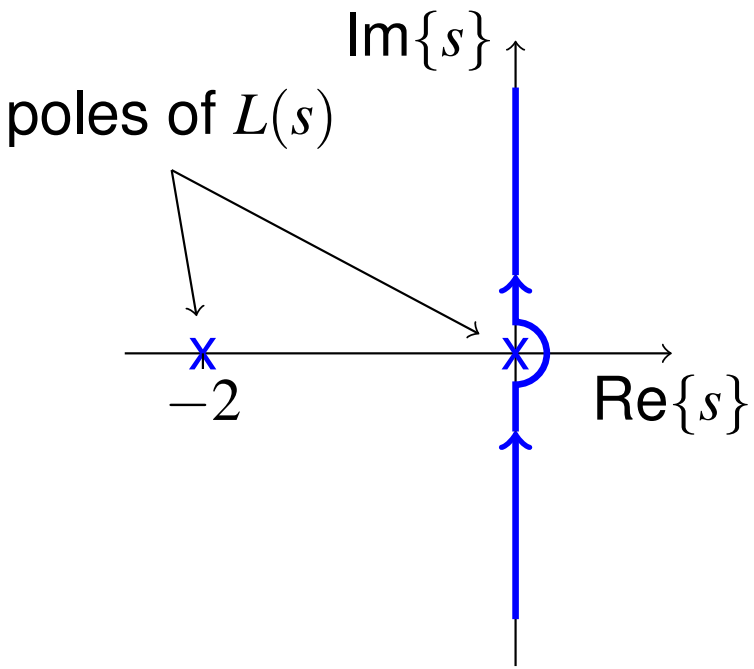


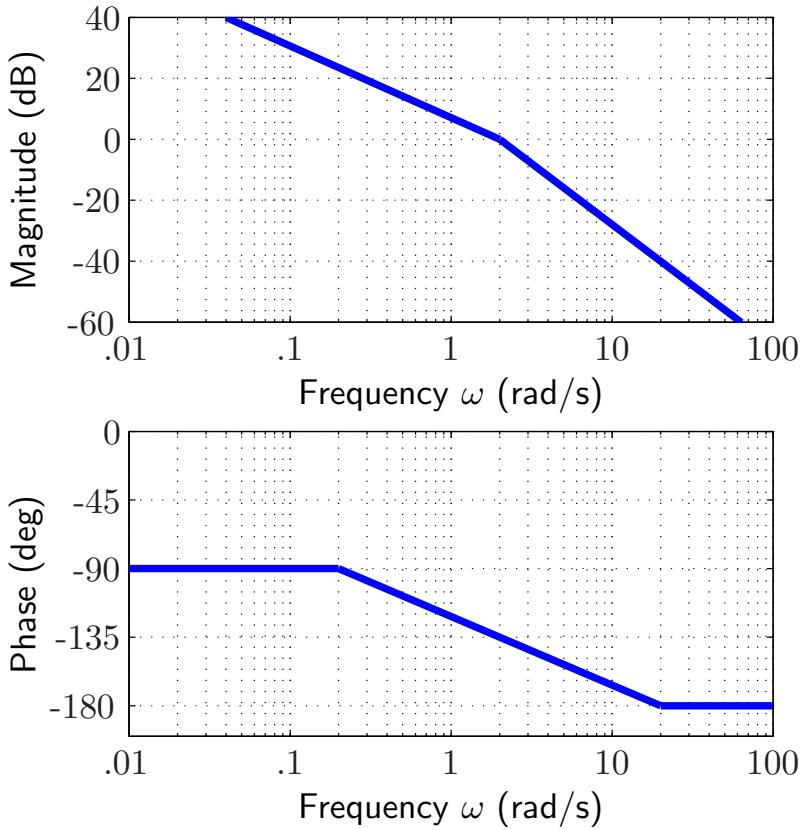
Modified Nyquist Domain



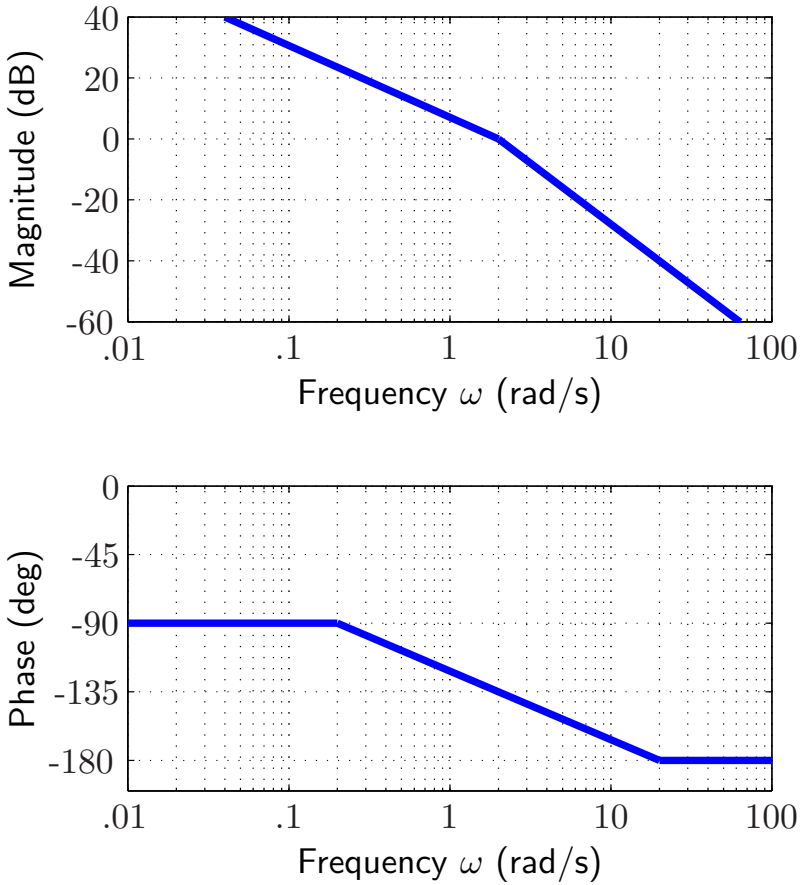

R(s)
+
−
4
s(s+2)
Y(s)

Modified Domain of Nyquist Plot

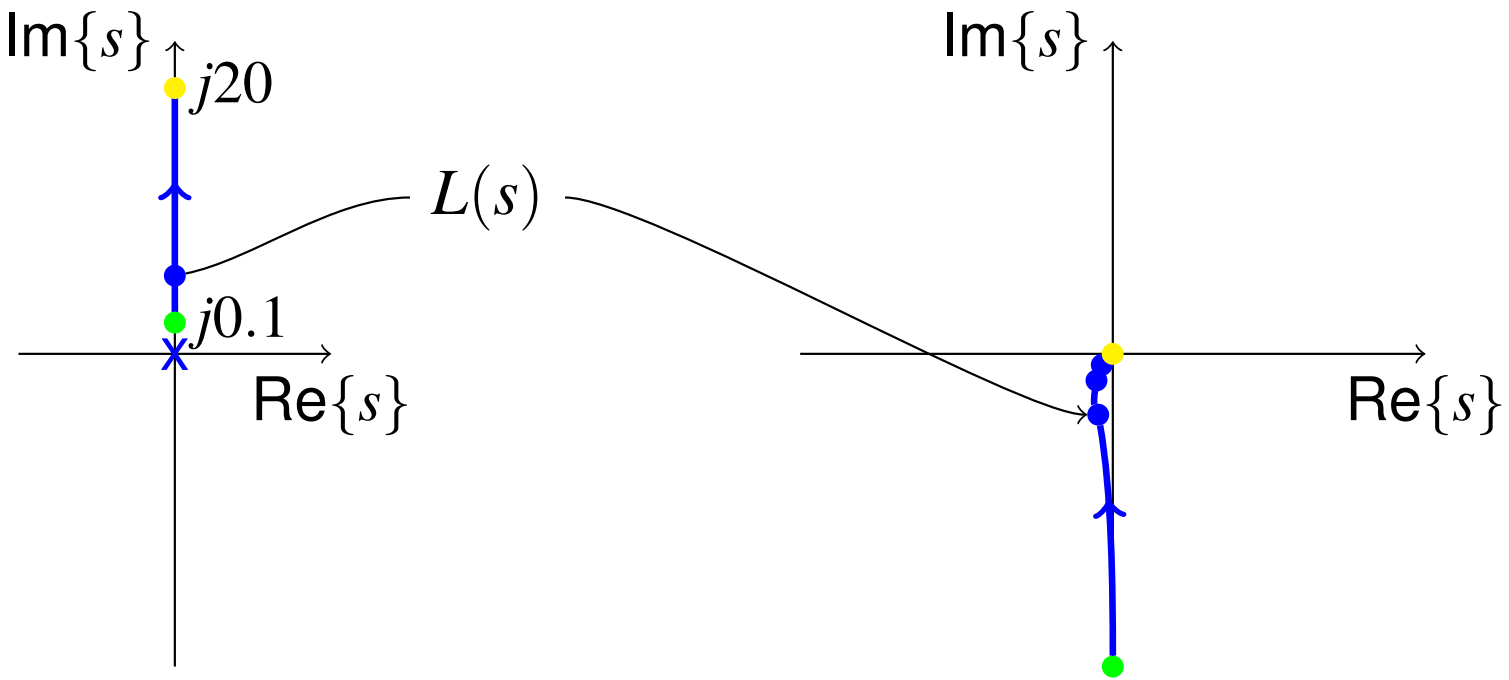


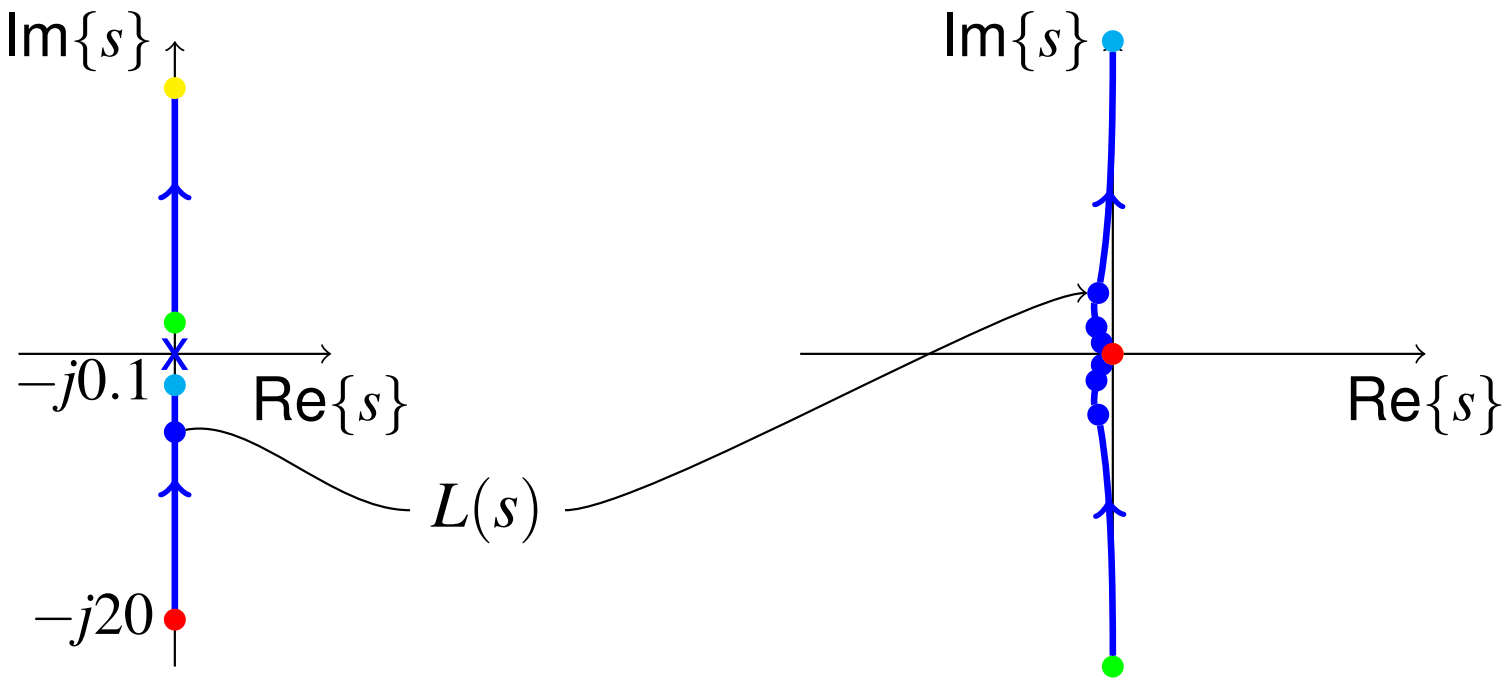


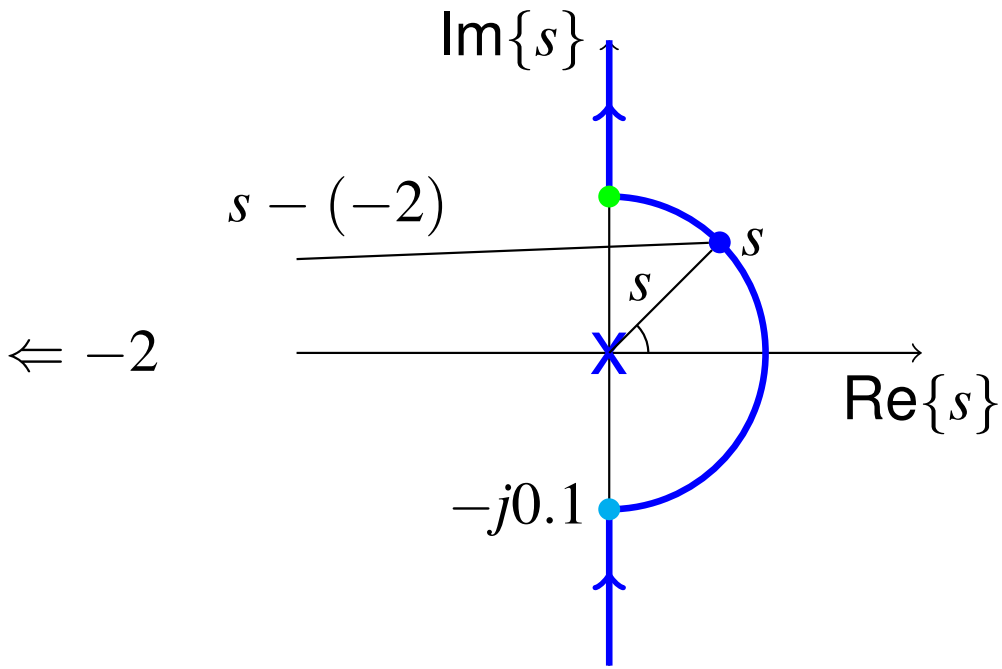
Magnitude and Phase Table

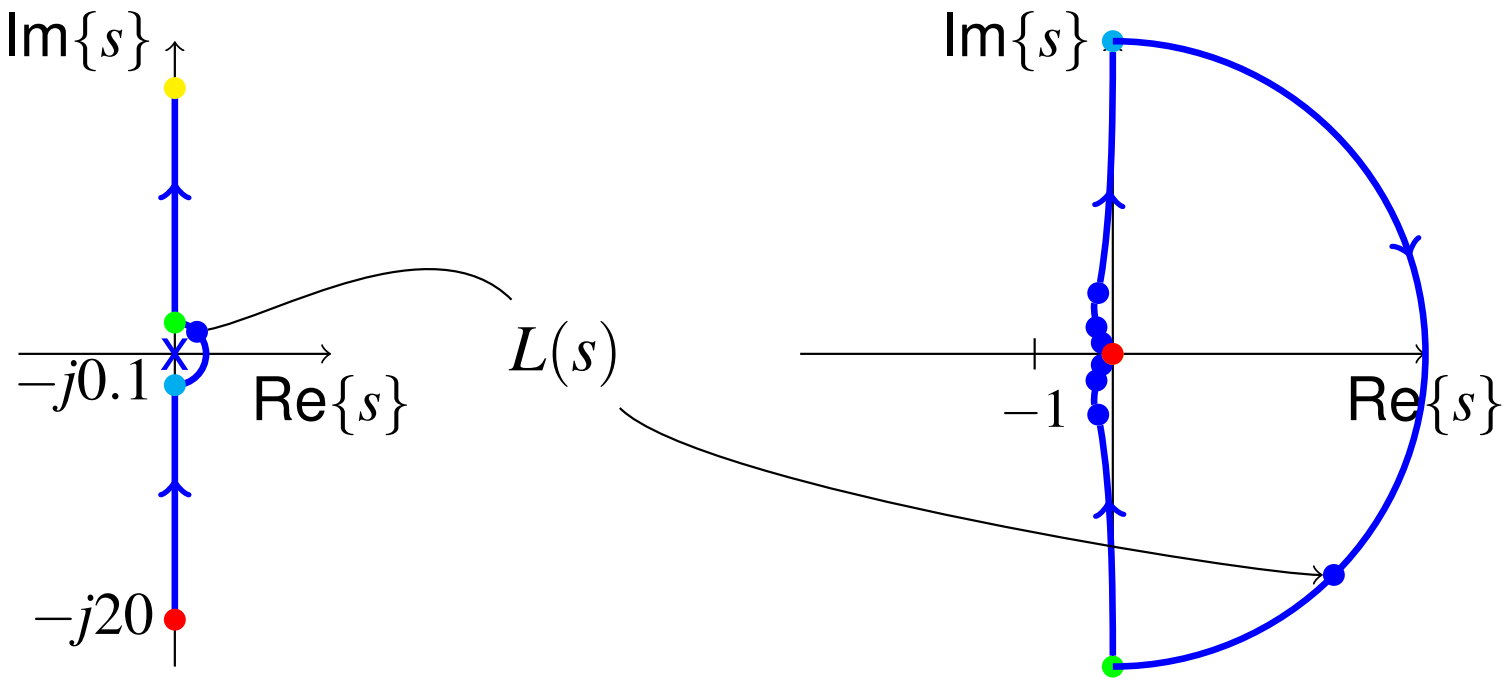


Freq (rad/s)	Mag (dB)	Mag	Phase
.1	26	20	-90°
.5	12	4	-103.5°
1	6	2	-121.5°
2	0	1	-135°
10	-30	0.03	-166.5°
20	-40	0.01	-180°


Im{s}
j20
j0.1
Re{s}
L(s)
Im{s}
Re{s}


Im{s}
−j0.1
Re{s}
−j20
L(s)
Im{s}
Re{s}


Im{s}
s − (−2)
s
s
⇐ −2
Re{s}
−j0.1


Im{s}
−j0.1
Re{s}
−j20
L(s)
Im{s}
−1
Re{s}