

0,1

1

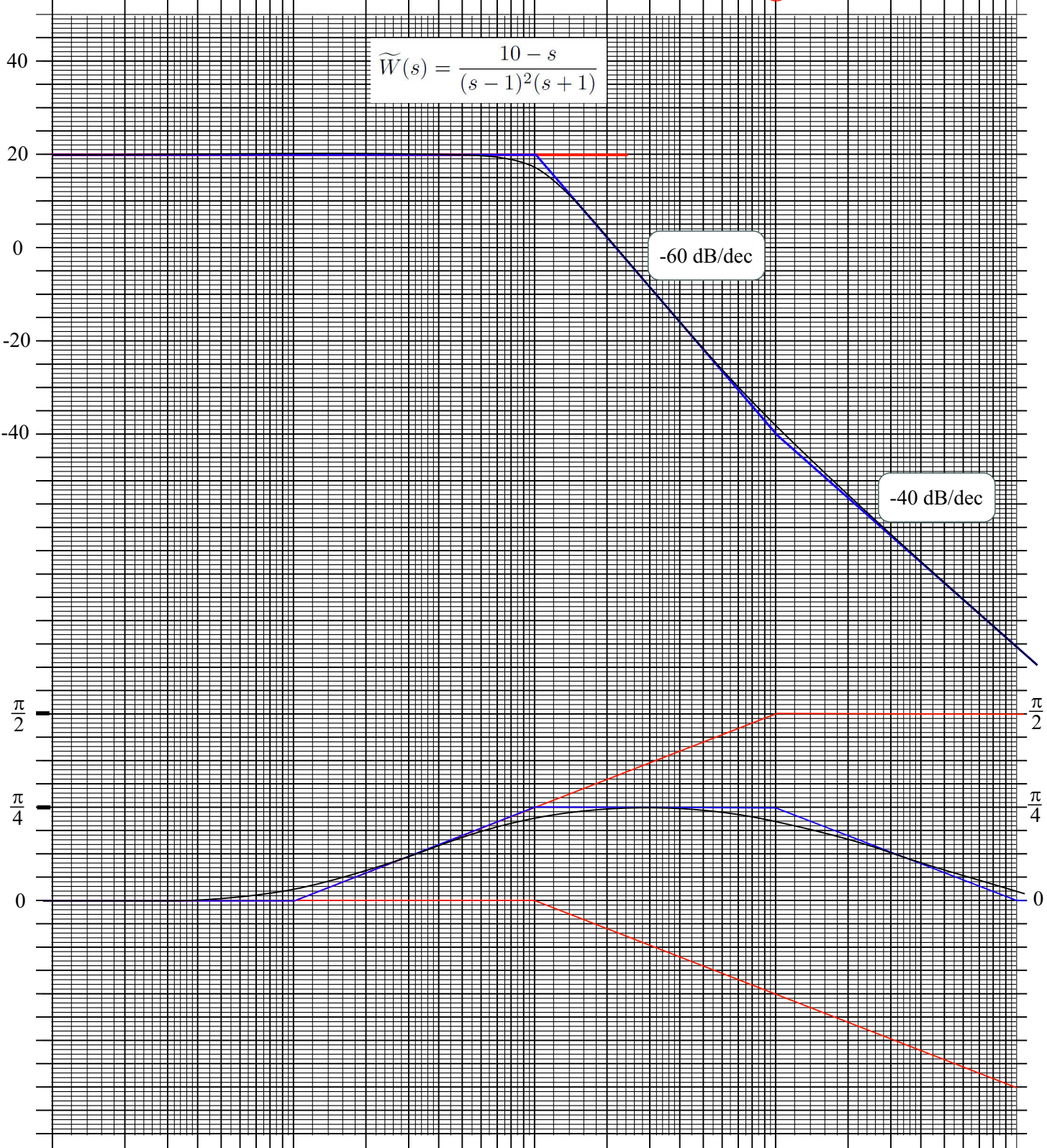
2

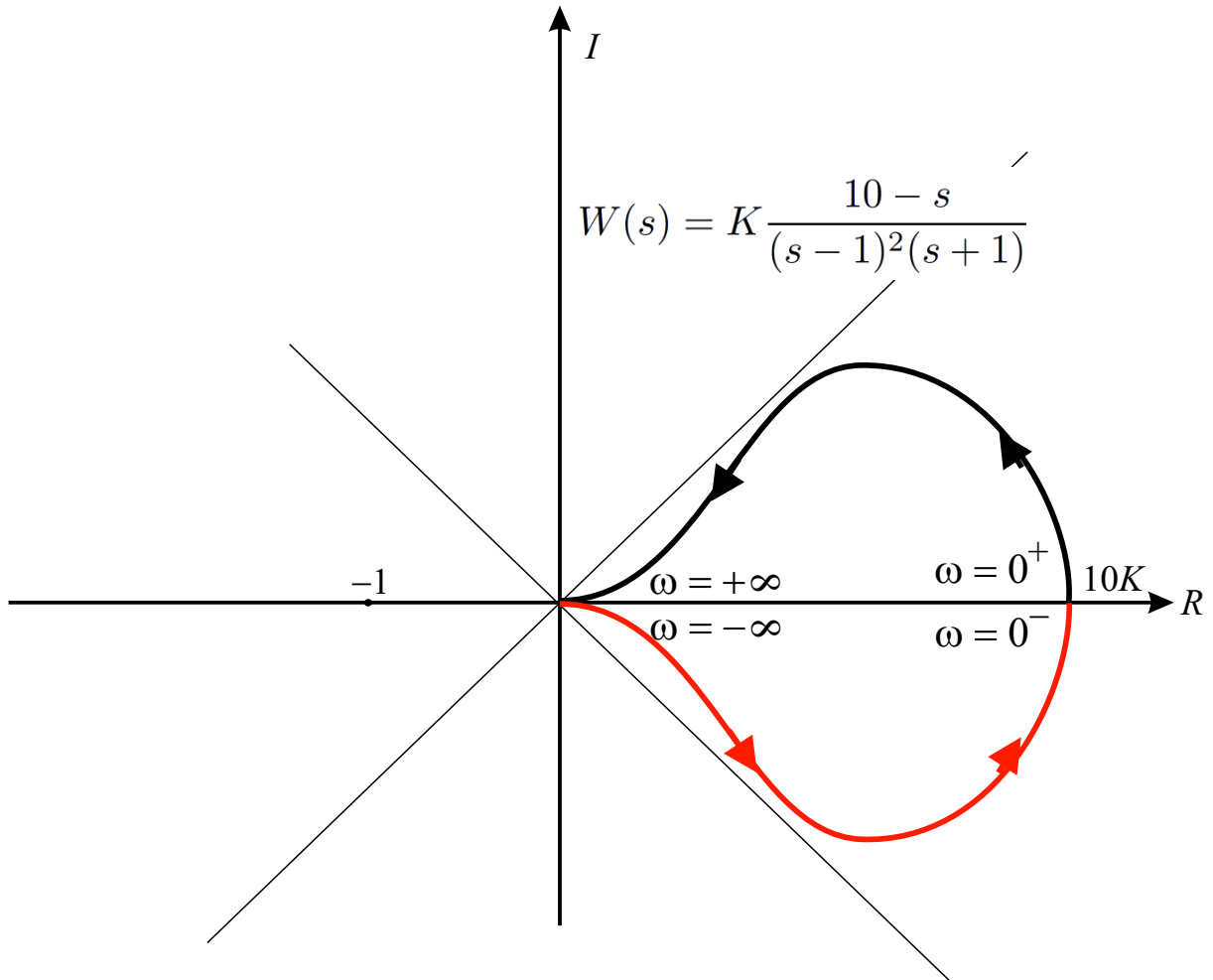
3

10

20

$$\widetilde{W}(s) = \frac{10 - s}{(s - 1)^2(s + 1)}$$





Nyquist Formula: $p_{cl} = p_{ol} - N$

where:

p_{ol} : number of poles with positive real part of the **open loop** transfer function $W(s)$

p_{cl} : number of poles with positive real part of the **closed loop** transfer function $W(s)/(1+W(s))$

N counts the number of encirclement of the point $-1+j0$ made by the graph of $W(j\omega)$

N positive for counterclockwise encirclements

In the problem, $p_{cl} = 2$.

For $K > 0$ we have $N=0$, and therefore $p_{cl} = 2$ (instability of the closed loop system)

For $K \in (-0.1, 0)$ we have $N=0$, and therefore $p_{cl} = 2$ (instability of the closed loop system)

For $K < -0.1$ we have $N=1$, and therefore $p_{cl} = 1$ (instability of the closed loop system)

Thus, the closed loop system is unstable for any feedback gain K .