Homework 4

ⓘ This is a preview of the published version of the quiz

Started: May 17 at 3:20p.m.

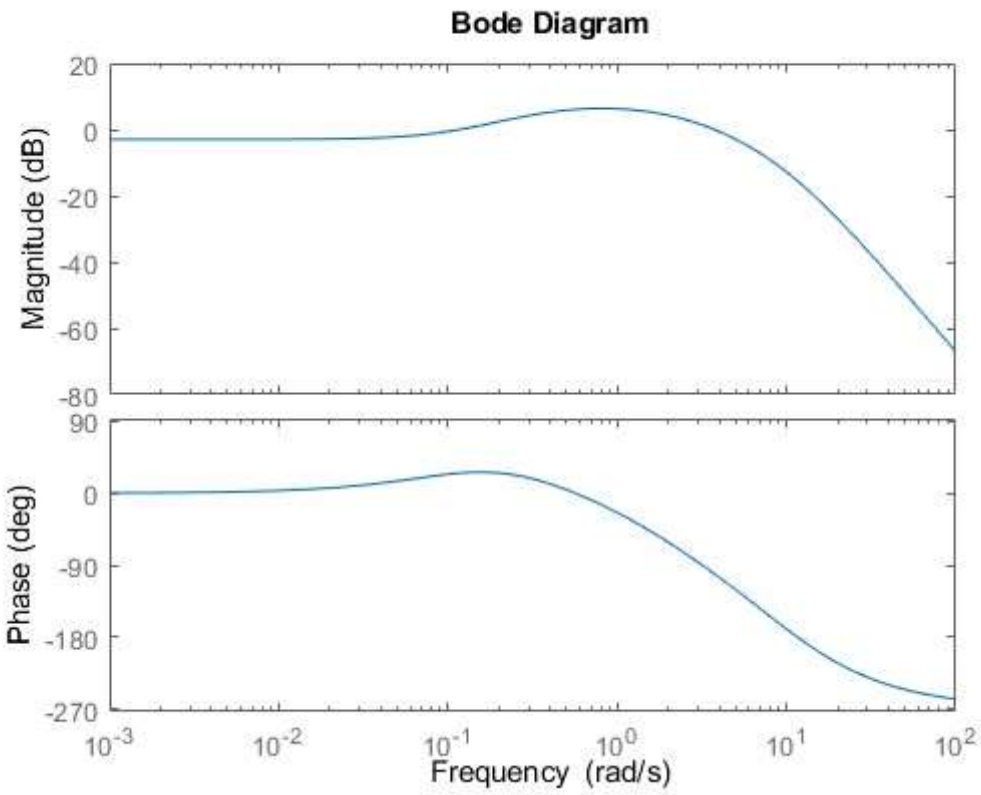
Quiz Instructions

In this homework assignment, we will practice frequency response (Bode, Nyquist) and Root Locus.

The homework is in a different format (a quiz) and includes multiple choice and numerical (with error margin) answer prompts. It is not timed, and you can resubmit twice (maximum 3 submissions). Your last submission will be graded automatically, and the answers will be accessible on following the deadline (**Nov 29 at 11:59 pm**)

Question 1 — 5 pts

Which transfer function corresponds to the following Bode plot?



A) $\frac{450(s+0.1)}{(s+9.5)^2(s+2)(s+0.4)}$

B) $\frac{450}{(s+9.5)^2(s+2)(s+0.4)}$

C) $\frac{450(s+0.1)}{(s+9.5)(s+2)(s+0.4)}$

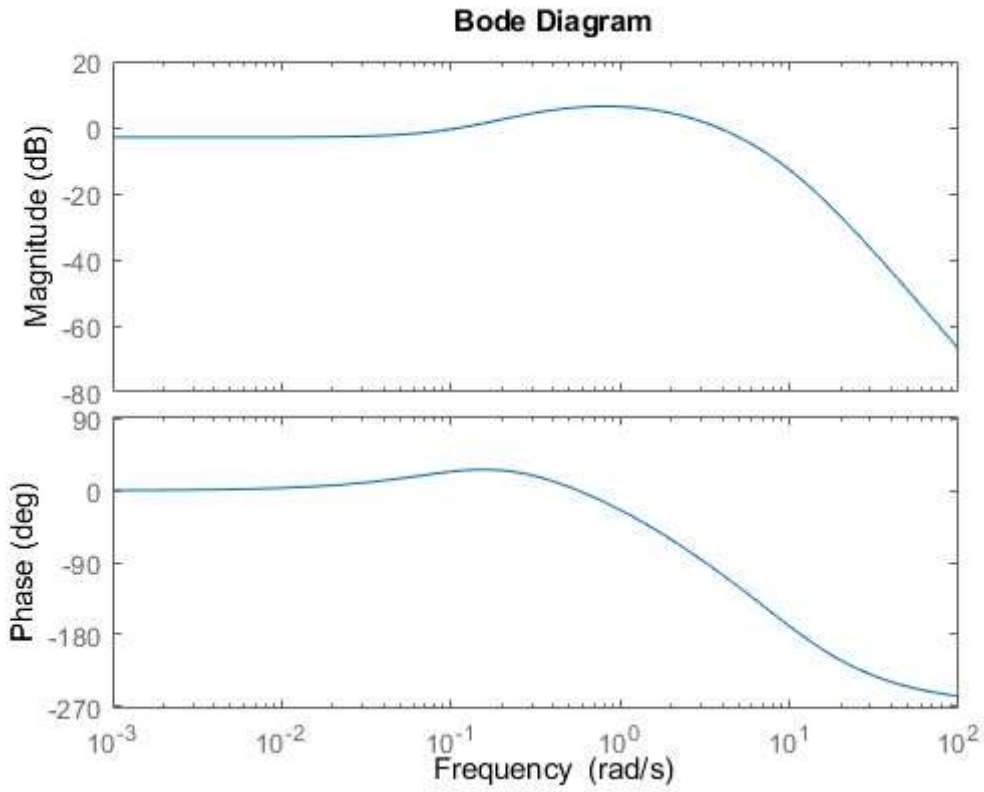
D) $\frac{450(s+3)}{(s+9.5)^2(s+2)(s+0.4)}$

- ○ A
- ○ B
- ○ C
- ○ D

Question 2

5 pts

Which of the following is true about the system with the following Bode plot?



A) Negative gain margin, positive phase margin, system is stable

B) Positive gain margin, positive phase margin, system is stable

C) Negative gain margin, negative phase margin, system is unstable

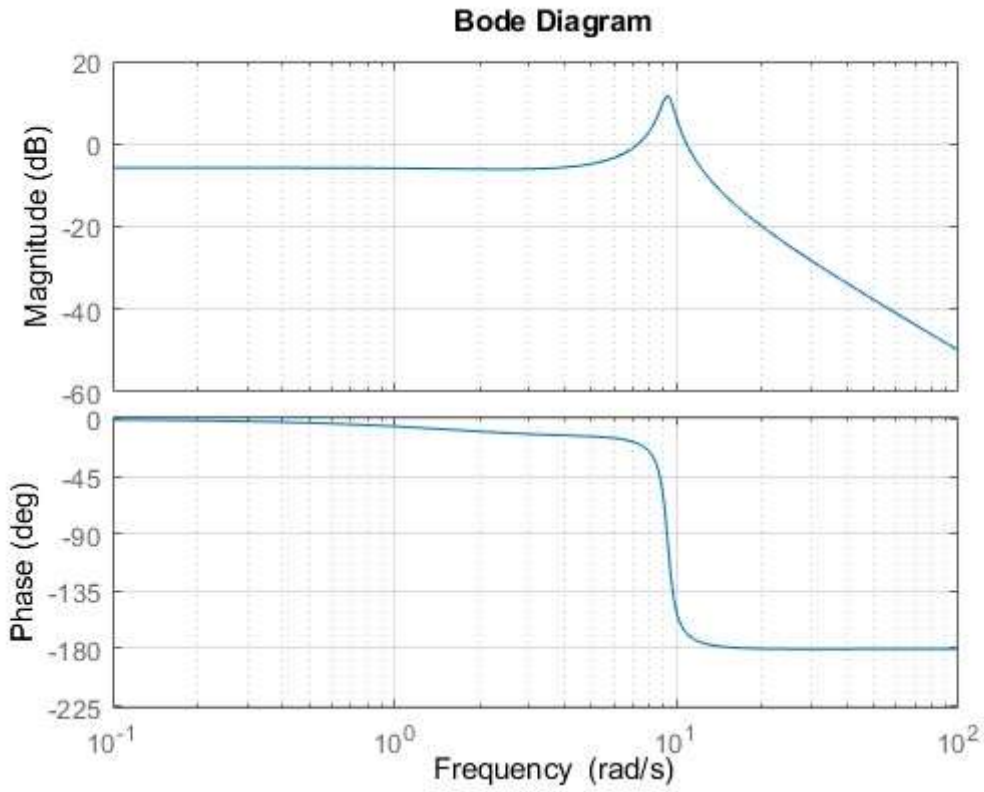
D) Negative gain margin, positive phase margin, system is unstable

- ○ A
- ○ B
- ○ C
- ○ D

Question 3

8 pts

Which transfer function corresponds to the following bode plot?



A) $\frac{300(s+4)}{(s+3)(s^2+s+86)}$

B) $\frac{31(s+4)}{(s+3)(s^2+s+10)}$

C) $\frac{300(s+4)}{(s+3)(s^2+s+10)}$

D) $\frac{31(s+4)}{(s+3)(s^2+s+86)}$

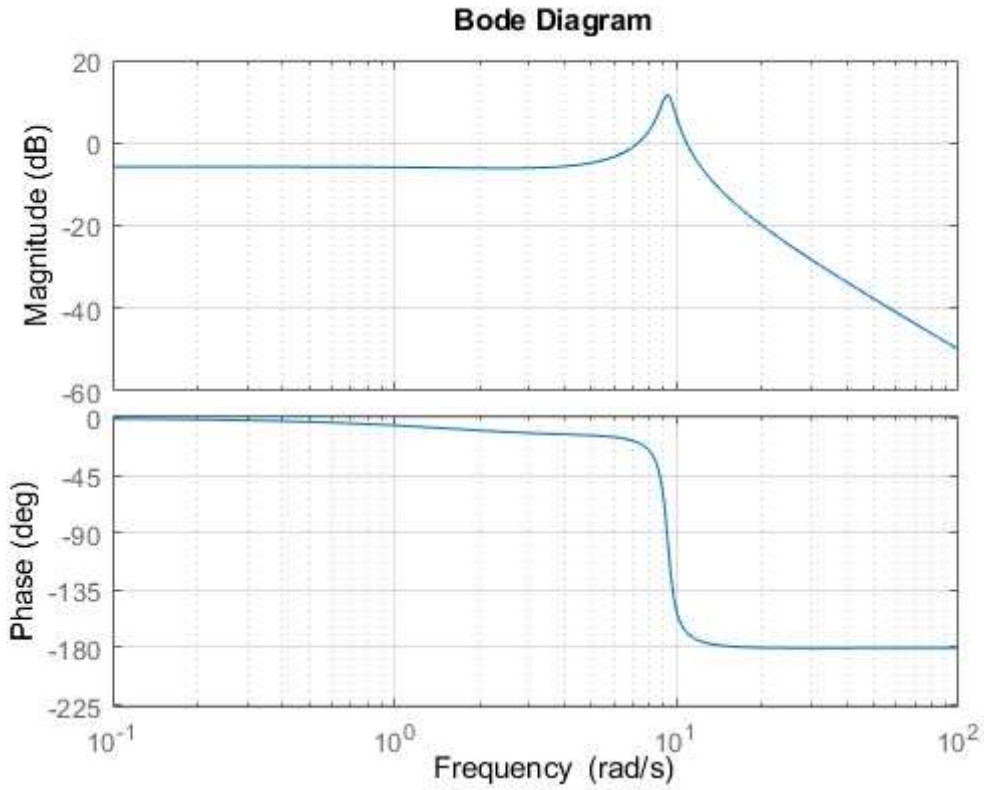
- ○ A
- ○ B
- ○ C
- ○ D

Question 4

7 pts

The open loop transfer function corresponding to the following Bode plot is placed in a feedback control loop with controller $G_c(s) = K$. At What value of K

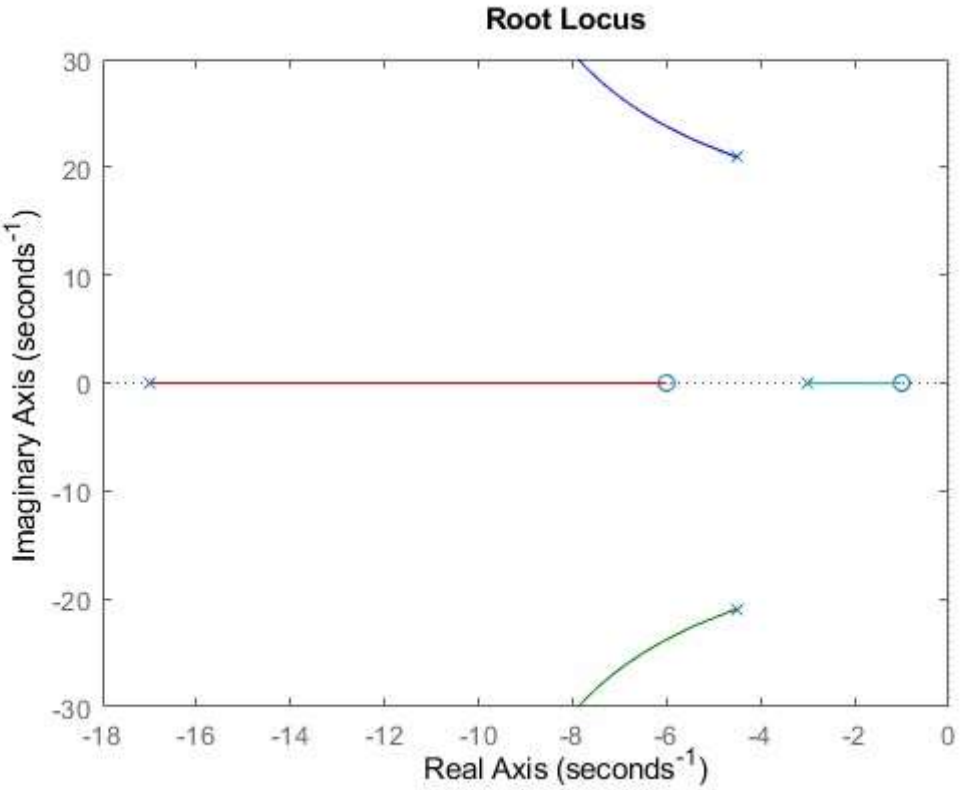
(approximately) does the closed loop system become unstable? Write your answer in absolute values (i.e. not dB). Note: If the system is stable for all values of K, answer 0.



Question 5

7.5 pts

Which **closed loop** transfer function is associated with the following root locus when the open loop transfer function is placed in a feedback control loop with controller $G_c(s) = 1$?



A) $\frac{s+6}{s^4+29s^3+688s^2+9600s+23300}$

B) $\frac{s^2+7s+6}{s^4+29s^3+688s^2+9600s+23300}$

C) $\frac{s^2+7s+6}{s^5+20s^4+29s^3+688s^2+9600s+23300}$

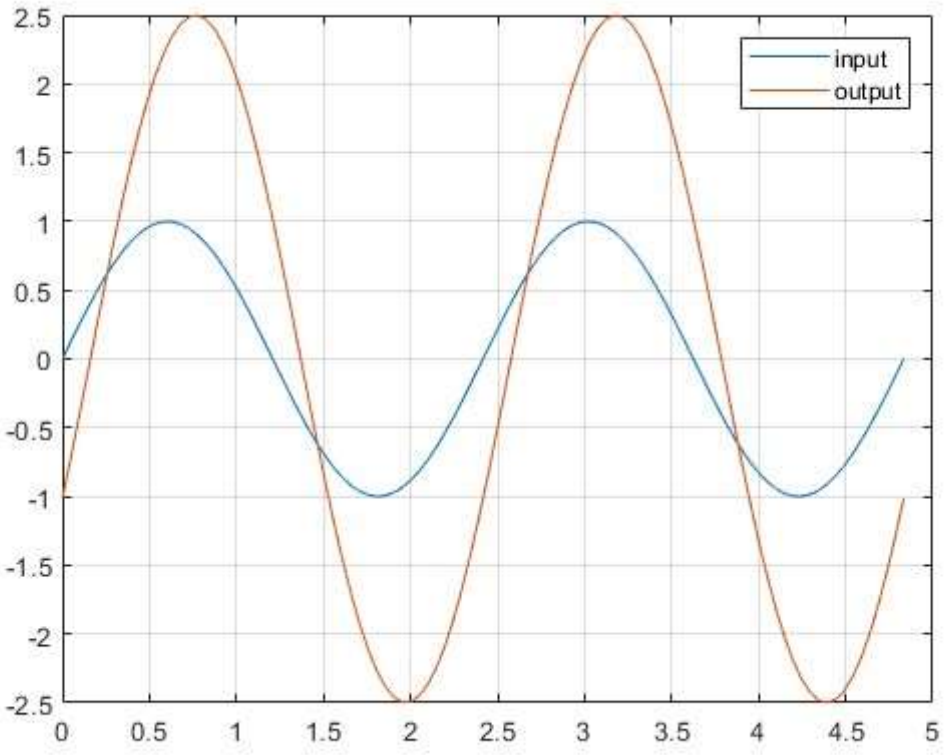
D) $\frac{s^3+2s^2+7s+6}{s^4+29s^3+688s^2+9600s+23300}$

- ○ A
- ○ B
- ○ C
- ○ D

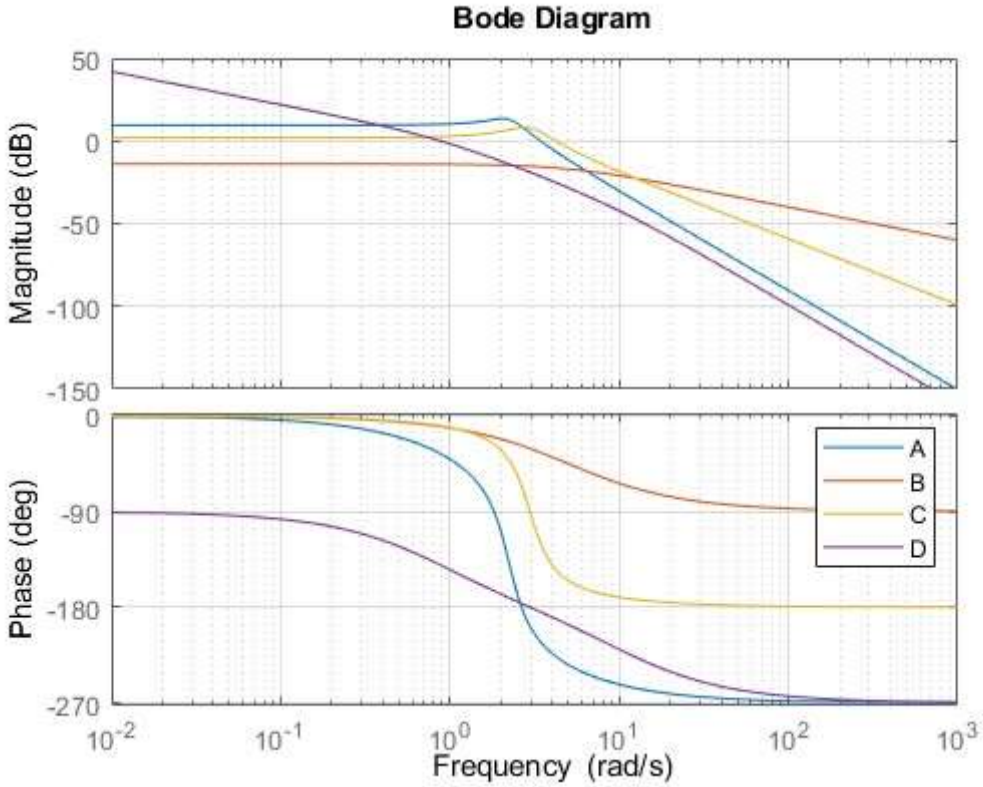
Question 6

7.5 pts

The blue and red sinusoidal signals in the figure below are the input and output of a transfer function block diagram, respectively. Note: the horizontal axis is Time (s).



Which bode diagram corresponds to the block's transfer function?



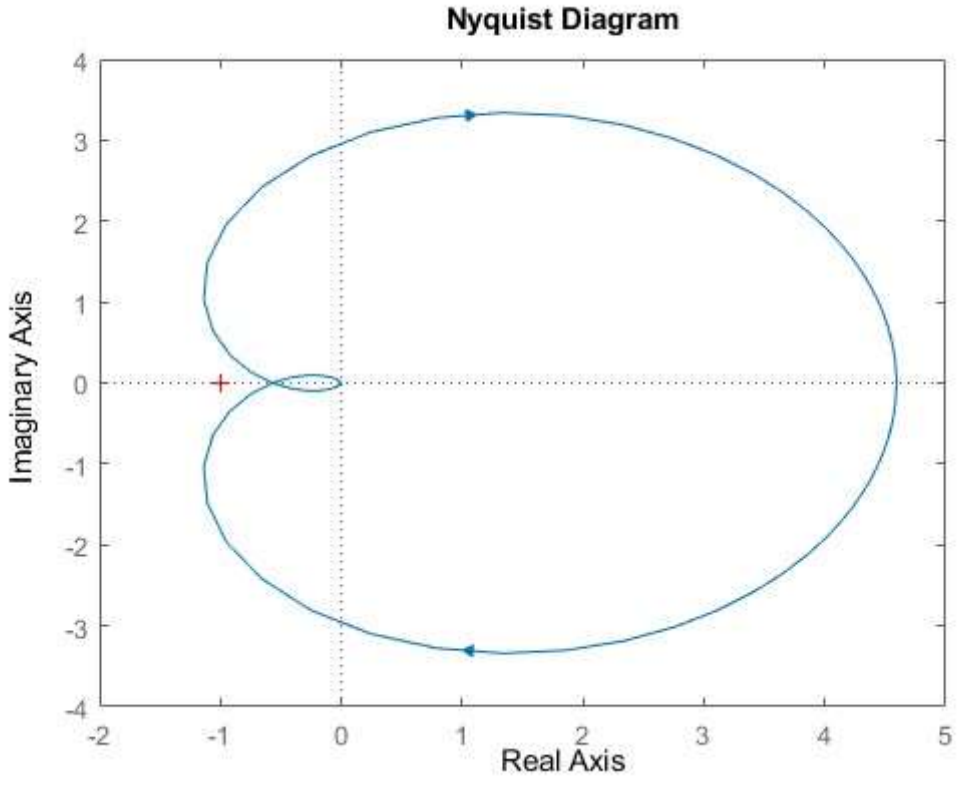
○ A

- ○ B
- ○ C
- ○ D

Question 7

0 pts

(Unmarked) The open loop transfer function, corresponding to the following Nyquist diagram and containing no poles in the open right-hand plane, is placed in a feedback loop with a controller $G_c(s) = K$. At what value of K does the closed loop system become unstable? If the system does not become unstable, type 0.



Not saved Submit Quiz