# Olin College of Engineering
# ENGR2410 – Signals and Systems

## Quiz 10

**Instructions**

A. Collaboration is not allowed on quizzes.

B. Students may only use a page of notes and the tables from the website during the quizzes.

C. Time is limited to one continuous hour.

D. Quizzes are due at the beginning of lecture on Thursday.

E. Late or missed quizzes will be given a score of zero. Any excuses must come directly from the Office of Student Life.

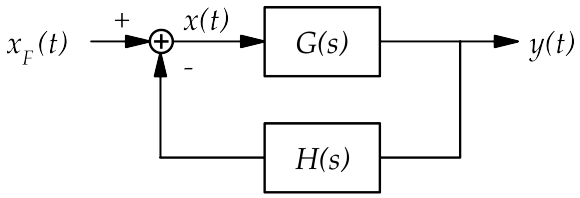
F. The two lowest quiz scores will be eliminated to allow for unforeseeable circumstances.

G. In case of doubt, students are expected to base their behavior on the values expressed in the Honor Code.

Name:

Start time:

**Problem 1** *(4 points)* In the system shown below, $G(s) = \frac{1}{s-1}$ and $H(s) = K$, where $K$ is a real constant. Assume the system and all inputs are causal.




A. Draw a pole-zero map of $G(s)$ indicating its region of convergence ($ROC$).

B. Find an algebraic expression and sketch the impulse response of $G(s)$.

C. Find the overall transfer function $G_F(s) = Y(s)/X_F(s)$.

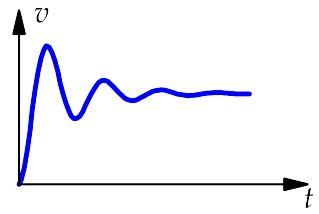
D. Draw a pole-zero map of $G_F(s)$ indicating its region of convergence ($ROC$).

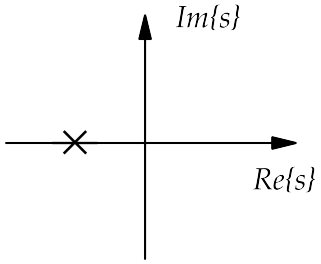
E. Find a requirement on $K$ that makes the system stable.

F. Find an algebraic expression and sketch the impulse response of $G_F(s)$ assuming a value of $K$ that makes the system stable.

**Problem 2** *(6 points)* For each part, indicate whether the system described at the beginning may be equivalent to the system representations listed afterwards. You may choose different values to match each representation. Note that any number of the representations below may be equivalent, including all or none. Provide a specific example for representations that are equivalent or clear justifications for representations that are not. *An answer without justification will not receive credit.*

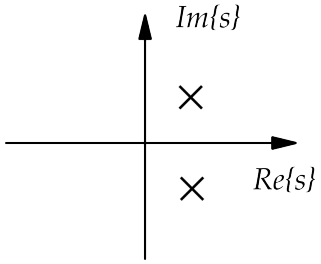
A. A system is described by the step response



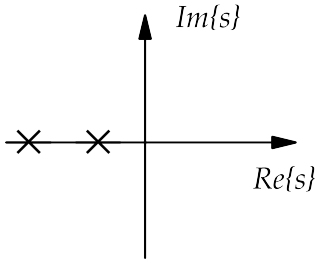

Circle your answer:

**equivalent** **not equivalent**



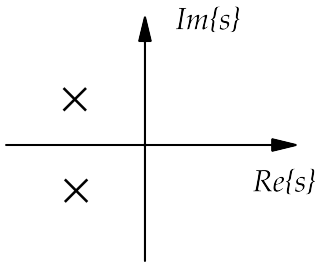

Circle your answer:

**equivalent** **not equivalent**



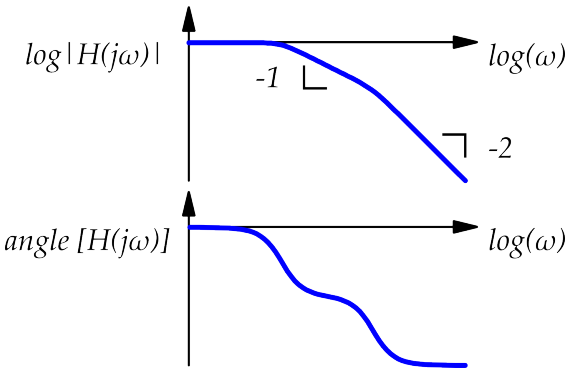

Circle your answer:

**equivalent** **not equivalent**




Circle your answer:

**equivalent** **not equivalent**



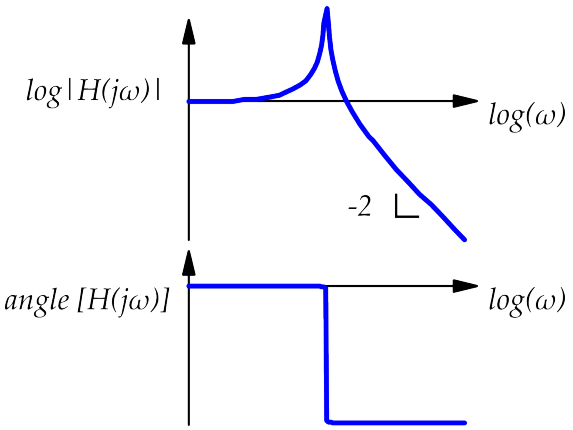

Circle your answer:

**equivalent** **not equivalent**

B. A system is described by the transfer function

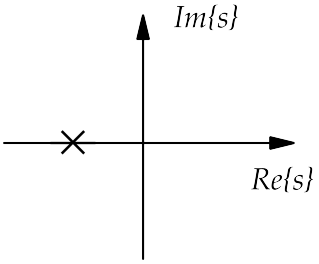
$$\frac{K}{s^2 + 2\alpha s + \omega_n^2}$$

where $K$, $\alpha$ and $\omega_n$ are **real** and **positive**.



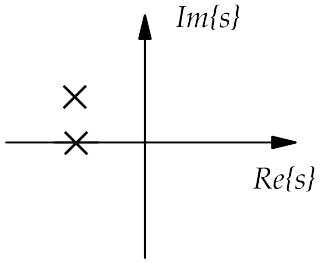

Circle your answer:

**equivalent** **not equivalent**



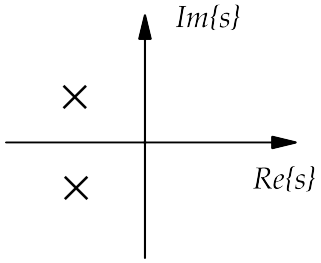

Circle your answer:

**equivalent** **not equivalent**



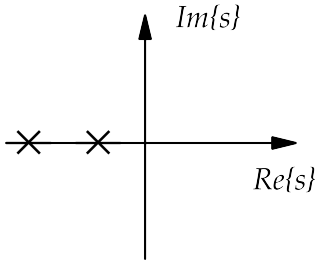

Circle your answer:

**equivalent** **not equivalent**




Circle your answer:

**equivalent** **not equivalent**



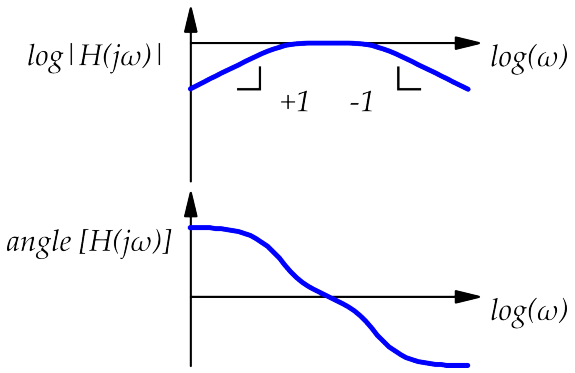

Circle your answer:

**equivalent** **not equivalent**

C. A system is described by the transfer function

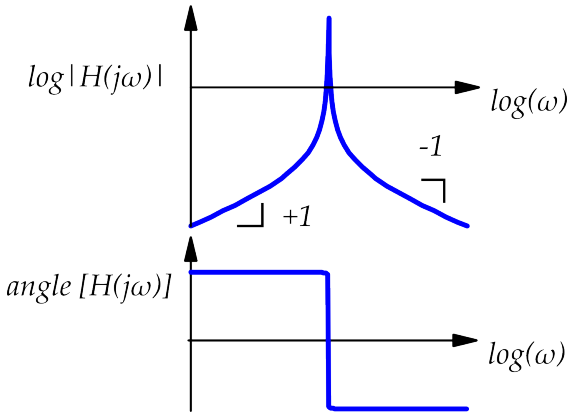
$$\frac{s}{(s+a)(s+b)}$$

where $a$ and $b$ are **real** and **positive**, and $a \neq b$.




Circle your answer:

**equivalent** **not equivalent**




Circle your answer:

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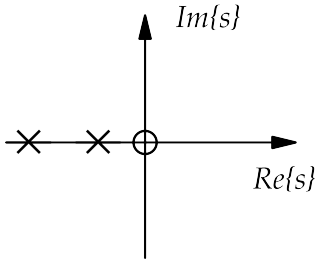


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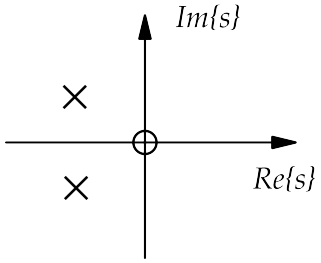


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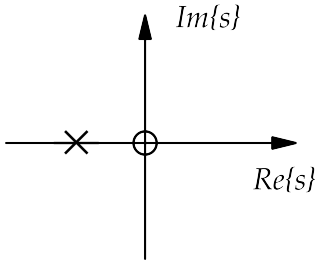


Circle your answer:

**equivalent** **not equivalent**

**Course feedback**
Feel free to send any additional feedback directly to us.

Name (optional):

A. End time: How long did the quiz take you?

B. Was the quiz a fair measure of your understanding?

C. Was the assignment effective preparation for the quiz?

D. Is the Monday session effective?

E. Are the connections between lecture, assignment and quiz clear?

F. Are the objectives of the course clear? Do you feel you are making progress towards those objectives?

G. Anything else?

**Assignment grades**

Date:

Assignment number:

Group member 1:

Grade:

Group member 2:

Grade:

Group member 3:

Grade: