Problems:

- **Problem 2:** Consider the open-loop transfer function:

\[
G(s) = \frac{100 \left(\frac{s}{10}\right) + 1}{s \left(\frac{s}{1} - 1\right) \left(\frac{s}{100} + 1\right)}.
\]

Use the Matlab function `bode` to plot the frequency response of the \( G(s) \).

1) Why does the phase start at 270 deg at the low frequencies?

2) From your bode plot, hand sketch the Nyquist plot for \( G(s) \).

3) Is the closed-loop system that includes \( G(s) \) in unity feedback stable?

- **Problem 3:** For the system shown in Fig. 1, suppose that:

\[
P(s) = \frac{5}{s (s + 1) \left(\frac{s}{5} + 1\right)}.
\]

Design a lead compensator \( K(s) \) so that the \( \phi_m > 40^\circ \) using Bode plot sketches. Then, verify and refine your design using Matlab.

---

**Fig. 1. Feedback Loop for Problem 3.**