1. Problems B-8-15, B-8-16, B-8-17, and B-8-19 in textbook. (You can use Matlab for the Nyquist plots.)

2. (This adapts from a past exam question) Consider the feedback system with unity feedback control shown below.

\[
\begin{align*}
U(s) &\rightarrow \times \rightarrow K \rightarrow H(s) \rightarrow Y(s)
\end{align*}
\]

In the figure at the next page, the Nyquist plot of \( H(s) \) is shown for \(-\infty < \omega < +\infty\), with the arrow denoting increasing \( \omega \). In case you need it, the point \(-1+j0\) is shown with a “+” on the plot.

You are given that the number of unstable poles (i.e., poles with nonnegative real part) of \( H(s) \) is one.

(a) What is the number of zeros of \( H(s) \) with positive real part?
(b) What is the number of unstable poles for the closed-loop system with \( k = 0.1 \)?
(c) What is the number of unstable poles for the closed-loop system with \( k = 1 \)?
(d) What is the number of unstable poles for the closed-loop system with \( k = 10 \)?
(e) Find the range of values of \( k \) for the closed-loop system to be stable.
Figure: Nyquist plot for problem Z. The real versus imaginary parts of the frequency response \( H(j\omega) \) are shown for \(-\infty < \omega < \infty\), with the arrows denoting increasing \( \omega \) as usual. In case you need it, the point \(-1 + j0\) is shown with a "+" on the plot.