EE 233 Homework 5.

4-1. Pole mapping from s-domain to the z-domain.

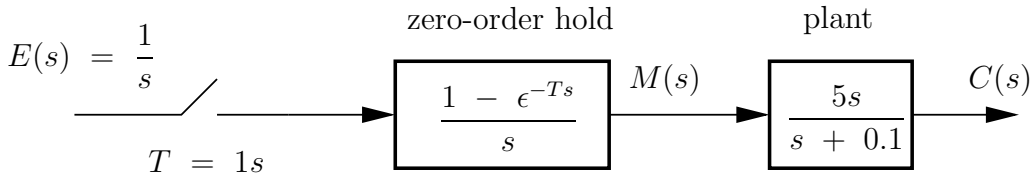
a. Show that a pole of $E(s)$ in the left half-plane transforms into a pole of $E(z)$ inside the unit circle.
b. Show that a pole of $E(s)$ on the imaginary axis transforms into a pole of $E(z)$ on the unit circle.
c. Show that a pole of $E(s)$ in the right half-plane transforms into a pole of $E(z)$ outside the unit circle.

4.2. Let $T = 0.05\ s$ and

$$E(s) = \frac{s + 2}{(s - 1)(s - 2)}$$

a. Without calculating $E(z)$, find its poles.
b. Give the rule that you used in part a.
c. Verify the results of part a. by calculating $E(z)$.
d. Compare the zero of $E(z)$ with that of $E(s)$.
e. The opf $E(z)$ are determined by those of $E(s)$. Does an equivalent rule exist for zeros?

4.5. Given the following system



a. Find the system response at the sampling instants to a unit step input for the above system. Plot $c(nT)$ versus time.
b. Verify your results of a. by determining the input to the plant, $m(t)$ and then calculating $c(t)$ by continuous-time techniques.
c. Find the steady-state gain for a constant input (dc gain), from both the pulse transfer function and from the plant transfer function.
d. Is the gain in part c. obvious from the results of parts a. and b. Why?