1. ECE166 Problem:

   a) Use an LC matching network to match $30+j200 \, \Omega$ to $50 \, \Omega$. Determine the value of $L$ (nH) and $C$ (pF) at 5 GHz. You must use the Smith chart to do this matching problem. Show your work on the Smith chart and present the Smith chart with your solution.

   b) A transmission line is 1 m long with a loss of 3 dB/m, and is connected to load $Z_L=20-j50 \, \Omega$. Determine $\Gamma$ and the VSWR at the load and at the input of the transmission line. For $V_{o+}=1 \, \text{Vrms}$ at the load, determine the power dissipated in the load and the power dissipated in the line. Also determine $P+$ and $P-$ at the input of the transmission line.
2) ECE265 Problem:

Reducing IM3 Contributions: Consider a 1GHz amplifier with IIP3 of 20 dBm and a 20 MHz bandwidth. Two 0 dBm signals at 1 GHz and 999 MHz are introduced to the input of the amplifier. The figure below shows the tones at the input of the amplifier.

a. At what frequency are the IM3 products located that would fall within the amplifier bandwidth?

b. What is the power of each of the IM3 products? Hint: If you have difficulty, try to use graphical reasoning.

c. You are offered a very high-Q filter that can reduce the power of the tone at 1GHz by 10dB without not filtering the tone at 999MHz. What is the new power of each of the IM3 tones?