NOTE: All problems are from the 4th edition of the text. Older versions have different problems. You must use the 4th edition for the problems.

Problem 1: Pozar, problem 10.13

Problem 2: Pozar, problem 10.14

Problem 3: Pozar, problem 10.15 (Example 10.4 is on page 518)

Problem 4: A non-linear two-port's input-output characteristic can be modeled as:

\[ v_{\text{out}} = \begin{cases} 
12v_{\text{in}} - v_{\text{in}}^3 & |v_{\text{in}}| \leq 2 \\
16\frac{v_{\text{in}}}{|v_{\text{in}}|} & |v_{\text{in}}| > 2 
\end{cases} \]

a.) Suppose that this 2-port has input and output impedances = 50 Ω, and that it is used with a 50 Ω source and load. Find the input power level that causes 1 dB of gain compression. Express your result in dBm.

b.) Suppose that two signals are input to the 2-port, for example let

\[ v_{\text{in}} = A_1 \cos(\omega_1 t) + A_2 \cos(\omega_2 t) \], with \( A_1 + A_2 < 2 \). List all of the frequencies that will appear at the output.

c.) Assume that the two signals in part b.) have equal amplitudes, \( A_1 = A_2 = A \). Find the maximum input signal power (for each signal) that will cause the in-band third-order components to be 30 dB less than the desired signals at the output of the 2-port. You may assume that gain compression can be ignored at this input power level. Express your result in dBm.