TCOM 500: Modern Telecommunications
Prof. B.-P. Paris
Homework 8
Due: April 15, 2010

Reading Chapters 4 and 7 in Forouzan; review class notes.

Problems

1. Problem 4.12
2. Problem 4.18
3. Problem 7.13
4. Problem 7.16
5. **Link Budget**
   A wireless communication system's transmitted signals are attenuated according to the following path loss model:

$$L_{P(dB)} = -50 + 10 \cdot \log_{10}(f) + 30 \cdot \log_{10}(d),$$

   where d denotes the distance between transmitter and receiver in meters and the carrier frequency $f = 1$ GHz. Further, the system is characterized by

   - thermal noise PSD $N_0 = -174$ dBm/Hz,
   - signal bandwidth $B = 1$ MHz,
   - required $SNR = 10$ dB.

   (a) Assuming the transmitter power equals 1 Watt, what is the transmission range d?

   (b) How much transmit power is required to communicate over a distance of 2 km.

   (c) For a given transmit power, by how much does the range increase if the bandwidth B is reduced to 100 KHz?