Problem 1

Reading: 2.4.3 What is the physical interpretation of A^{+}_{2} in equation 2.125?

Problem 2

The ideal waveguide in jkps has pressure-release boundaries. Another ideal waveguide is one in which the top and bottom boundaries are rigid instead of pressure release. Discuss what you think the mode shapes would be in this case. (hint: think of why the modes go to zero at the boundaries of the waveguide in the pressure-release case. What must the modes look like near the boundary to satisfy the rigid boundary conditions?)

Problem 3

Consider a 200 m waveguide, with pressure release boundaries and c=1500m/s

a) A whale at 100 m depth has a pressure level of 150 dB re 1μPa at 1 m.
What is the pressure level you receive at 10100m?
b) The noise at the receiver is 75 dB. What is the SNR (Signal to Noise Ration)
c) Processing with an array of hydrophone gives an array gain of 5dB. What is the array SNR?
d) We have a detection threshold of 5 dB. What is the signal excess ? Can we observe the whale?

Regarding 3a) the units is discussed in section COA 1.3.3 with more detail in the first few pages of chapter 10. Thus
A1) 1micro Pascal =1μPa= 10^{-6}Pa.
A2) "The pressure level of 150 dB re 1uPa at 1 m." means
$P_{dB}(1m)=20\log_{10}[p(1m)/p_0]=150$
With p0=1μ Pa
Thus p(1m)= 10^{-6}Pa *$10^{150/20}$=$10^{3/2}$Pa=30Pa
A3)p(10km)=p(1m)*TL_{lin}