Lab 2 solutions

Part I
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1) v = f*wavelength where f=20 Hz and wavelength = 0.11 m/5; so
   v = 20*0.11/5 = 0.44 m/s

Part II
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1) Using angle of incidence = angle of reflection, the incident parallel rays will be reflected through a focal point (like for a converging mirror)

Part III
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1) Sound propagation is refracted downward (away from the normal) as sound travels from lower elevations (cooler air) to higher elevations (hotter air). This looks like an upside-down U-shaped curve.

Part IV
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1) Adding two sine waves that are 90 degrees out of phase with one another produces another sine wave with same frequency, but with an amplitude sqrt(2)x larger and phase shifted by 45 degrees

Part IV.A
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1) Increasing the frequency will increase the number of radial lines. The wave velocity is unchanged, so the wavelength decreases.

Part IV.B
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1) Constructive interference, because the sound waves travel the same distance from the two speakers.

2) If the frequency is increased, the number of audible maxima and minima would increase.

3) Interference of sound waves is undesirable in rooms and concert halls since you don't want regions of enhanced or diminished sound. By adding many reflecting surfaces between the sources of the sound and the listener, the sound field becomes more homogeneous, making it less likely to have regions of total constructive or destructive interference.

Part V

An opening can be thought of as two barriers placed next to one another.

1) For wavelengths << the size of the opening, the waves pass through with very little spreading into the shadow regions of the opening.

2) For wavelengths comparable to the size of the opening, the waves spread into the shadow regions of the opening.