(a) \( [\Delta P]_m = 1.48 \text{Pa} \)
(b) \( f = \frac{334 \text{rad/s}}{2 \pi \text{rad}} = 167 \text{Hz} \)
(c) \( \lambda = \frac{(2 \pi \text{rad})}{(1.07 \pi \text{rad/m})} = 1.87 \text{m} \)
(d) \( v = (167 \text{Hz})(1.87 \text{m}) = 312 \text{m/s} \)

\( \varepsilon \text{19-10} \) Use \( s_m = \frac{[\Delta P]_m}{kB} \) and \( v = \sqrt{\frac{B}{\rho_0}} \). Then \( [\Delta P]_m = kB s_m = kv^2 \rho_0 s_m = 2\pi f v \rho_0 s_m \), and, since
\[ I = \frac{P_m}{A} = \frac{[\Delta P]_m^2}{2\rho v}, \]
we have \( I = 2\pi^2 \rho f^2 s_m^2 \).

\( \varepsilon \text{19-11} \) If the source emits light in all directions the intensity at a distance \( r \) is given by the average power divided by the surface area of a sphere of radius \( r \) centered on the source. The power output of the source can then be found from
\[ P = I A = I \left(4\pi r^2\right) = (197 \times 10^{-6} W/ m^2) 4\pi (42.5 m)^2 = 4.47 W. \]

\( \varepsilon \text{19-12} \) Using the results of \( \varepsilon \text{19-10} \), we see that
\[ s_m = \sqrt{\frac{(1.13 \times 10^{-8} W/m^2)}{2\pi^2 (5.212 kg/m^3)(343 m/s)(313 Hz)^2}} = 3.75 \times 10^{-8} \text{m}. \]

\( \varepsilon \text{19-17} \) Intensity is (energy density) \( v \) (speed), or \( I = uv \). Here
\[ I = \frac{P_m}{4\pi A} = (5200 W) / (4\pi (4820 m)^2) = 1.78 \times 10^{-5} W/m^2. \]
The energy density is then
\[ u = \frac{I}{v} = (1.78 \times 10^{-5} W/m^2) / (343 m/s) = 5.19 \times 10^{-8} J/m^3. \]

\( \varepsilon \text{19-20} \) Let one person speak with intensity \( I_1 \). \( N \) people would have an intensity \( NI_1 \). The ratio is \( N \), so by Eq. 19-21
\[ SL_N = (8.4 dB) + 10 \log(2.71 \times 10^3) = 63 dB. \]

\( \varepsilon \text{19-28} \) Using our mantra, the wavelength is twice the distance between the nodes, so \( \lambda = 7.68 \text{cm} \). The frequency is thus
\[ f = \frac{(1520 m/s)}{(7.68 \times 10^{-2} m)} = 1.98 \times 10^4 \text{Hz}. \]

\( \varepsilon \text{P19-7} \) (a) \( I = P / 4\pi r^2 = (31.6 W) / 4\pi (194 m)^2 = 6.68 \times 10^{-5} W/m^2. \)
(b) \( P = IA = (6.68 \times 10^{-5} W/m^2)(75.2 \times 10^{-6} m^2) = 5.02 \times 10^{-9} W. \)
(c) \( U = Pt = (5.02 \times 10^{-9} W)(2.5 \text{min})(60 \text{s/min}) = 7.53 \mu J. \)