58. (a) Differentiating Eq. 20-53, we obtain

$$\frac{dp}{dV} = (\text{constant})\frac{-\gamma}{V^{\gamma+1}} \quad \Longrightarrow \quad B = --V\frac{dp}{dV} = (\text{constant})\frac{\gamma}{V^{\gamma}}$$

which produces the desired result upon using Eq. 20-53 again ($p = (\text{constant})/V^{\gamma}$).

(b) Due to the fact that $v = \sqrt{B/\rho}$ (from Chapter 18) and $p = nRT/V = (M_{\text{sam}}/M)RT/V$ (from this chapter) with $\rho = M_{\text{sam}}/V$ (the definition of density) , the speed of sound in an ideal gas becomes

$$v = \sqrt{\frac{\gamma p}{\rho}} = \sqrt{\frac{\gamma(M_{\text{sam}}/M)RT/V}{M_{\text{sam}}/V}} = \sqrt{\frac{\gamma RT}{M}} \ .$$