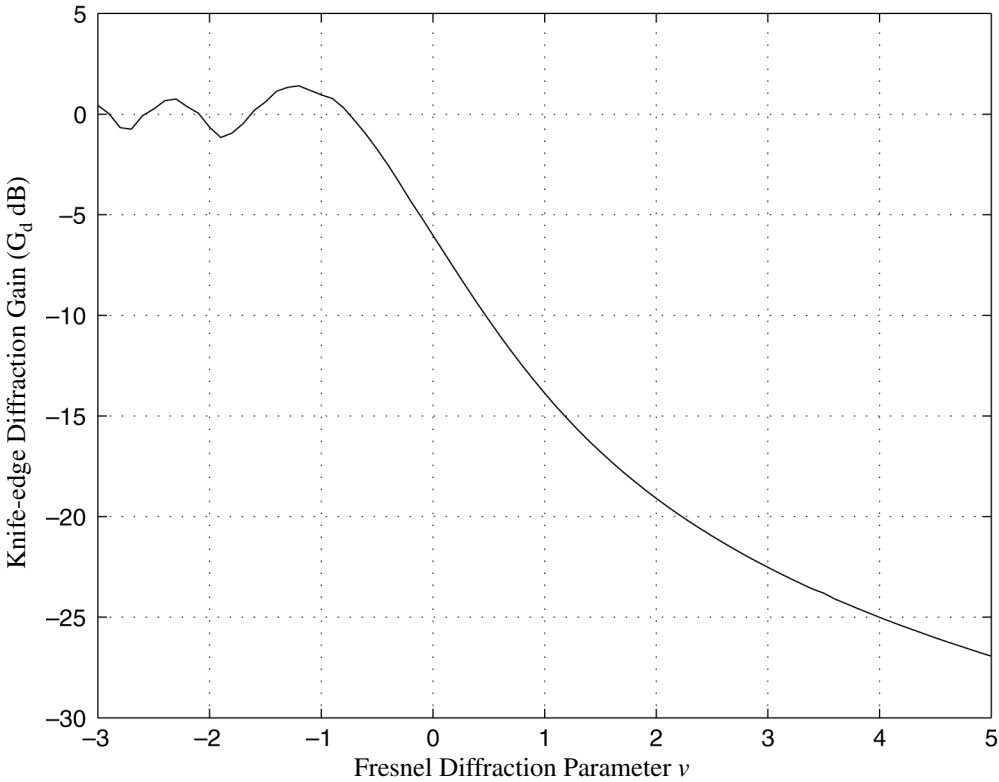

Example 4.7

Compute the diffraction loss for the three cases shown in Figure 4.12. Assume λ = 1/3 m, d_1 = 1km, d_2 = 1 km, and (a) h = 25 m, (b) h = 0, (c) h = –25 m. Compare your answers using values from Figure 4.14, as well as the approximate solution given by Equation (4.61.a)–(4.61.e). For each of these cases, identify the Fresnel zone within which the tip of the obstruction lies.

Given:

λ = 1/3 m

d_1 = 1 km

d_2 = 1 km

(a)h = 25 m

Using Equation (4.56), the Fresnel diffraction parameter is obtained as

$$\nu = h\sqrt{\frac{2(d_1 + d_2)}{\lambda d_1 d_2}} = 25\sqrt{\frac{2(1000 + 1000)}{(1/3) \times 1000 \times 1000}} = 2.74.$$

From Figure 4.14, the diffraction loss is obtained as 22 dB.