7.

At point (A), the source termination gives 1V RMS at coax input.

At point (B), $V_B = V_A e^{-\alpha z}$; where α is in Nepers/length

given $\alpha = \frac{0.1\,dB}{m} = \frac{0.1\,dB}{m} \cdot \frac{0.115\,Np}{dB} = \frac{.0115\,Np}{m}$, so

$V_B = 1 \cdot e^{-(0.0115 \frac{Np}{m} * 50m)}$

$\underline{V_B = 0.5627\ V_{RMS}}$

At point (C) the signal has been amplified by 6dB voltage gain. This is equal to:

$$6dB = 20 \log_{10}\left(\frac{V_{out}}{0.5627}\right) \quad \text{or}$$

$$1.995 = \frac{V_o}{0.5627} \ ; \ V_o = 1.123\ V_{RMS} \ \therefore \ \underline{V_c = 1.123\ V_{RMS}}$$

At point (C) power is $\frac{V^2}{R}$ or $\frac{(1.123)^2}{75} = 16.8\,mW$

in dBm: $dBm = 10 \log_{10}\left(\frac{16.8\,mW}{1\,mW}\right) = \underline{12.25\,dBm}$

From A to C: $\text{gain}(dB) = 20 \log_{10}\left(\frac{V_o}{V_{in}}\right) = 20 \log\left(\frac{1.123\ V_{RMS}}{1.0\ V_{RMS}}\right)$

$= \underline{1.008\,dB}$