7. $$G_{dB} = 20\log_{10}\frac{V_2}{V_1} = 20\ \log_{10}\frac{25\text{ V}}{10\text{ mV}} = 20\log_{10}2500$$

$$= 20(3.398) = \mathbf{67.96\ dB}$$

8. (a) Gain of stage 1 = A dB

Gain of stage 2 = 2 A dB

Gain of stage 3 = 2.7 A dB

A + 2A +2.7A = 120

A = **21.05 dB**

(b) Stage 1: $A_{v_1} = 21.05 \text{ dB} = 20 \log_{10}\frac{V_{o_1}}{V_{i_1}}$

$$\frac{21.05}{20} = 1.0526 = \log_{10}\frac{V_{o_1}}{V_{i_1}}$$

$$10^{1.0526} = \frac{V_{o_1}}{V_{i_1}}$$

and $\frac{V_{o_1}}{V_{i_1}} = 11.288$

Stage 2: $A_{v_2} = 42.1 \text{ dB} = 20 \log_{10}\frac{V_{o_2}}{V_{i_2}}$

$$2.105 = \log_{10}\frac{V_{o_2}}{V_{i_2}}$$

$$10^{2.105} = \frac{V_{o_2}}{V_{i_2}}$$

and $\frac{V_{o_2}}{V_{i_2}} = 127.35$

Stage 3: : $A_{v_3} = 56.835 \text{ dB} = 20 \log_{10}\frac{V_{o_3}}{V_{i_3}}$

$$2.8418 = \log_{10}\frac{V_{o_3}}{V_{i_3}}$$

$$10^{2.8418} = \frac{V_{o_3}}{V_{i_3}}$$

and $\frac{V_{o_3}}{V_{i_3}} = 694.624$

$A_{v_T} = A_{v_1} \cdot A_{v_2} \cdot A_{v_3} = (11.288)(127.35)(694.624) = 99{,}8541.1$

$A_T = 120 \text{ dB} \overset{?}{=} 20 \log_{10} 99{,}8541.1$

$120 \text{ dB} \cong 119.99 \text{ dB}$ (difference due to level of accuracy carried through calculations)

9. (a) $G_{dB} = 20\log_{10}\dfrac{P_2}{P_1} = 10\log_{10}\dfrac{48\text{ W}}{5\ \mu\text{W}} = \mathbf{69.83\ dB}$

(b) $G_v = 20\log_{10}\dfrac{V_o}{V_i} = 20\log_{10}\dfrac{\sqrt{P_oR_o}}{V_i} = \dfrac{20\log_{10}\sqrt{(48\text{ W})(40\text{ k}\Omega)}}{100\text{ mV}}$

$= \mathbf{82.83\ dB}$

(c) $R_i = \dfrac{V_i^2}{P} = \dfrac{(100\text{ mV})^2}{5\ \mu\text{W}} = \mathbf{2\ k\Omega}$

(d) $P_o = \dfrac{V_o^2}{R_o} \Rightarrow V_o = \sqrt{P_oR_o} = \sqrt{(48\text{ W})(40\text{ k}\Omega)} = \mathbf{1385.64\ V}$

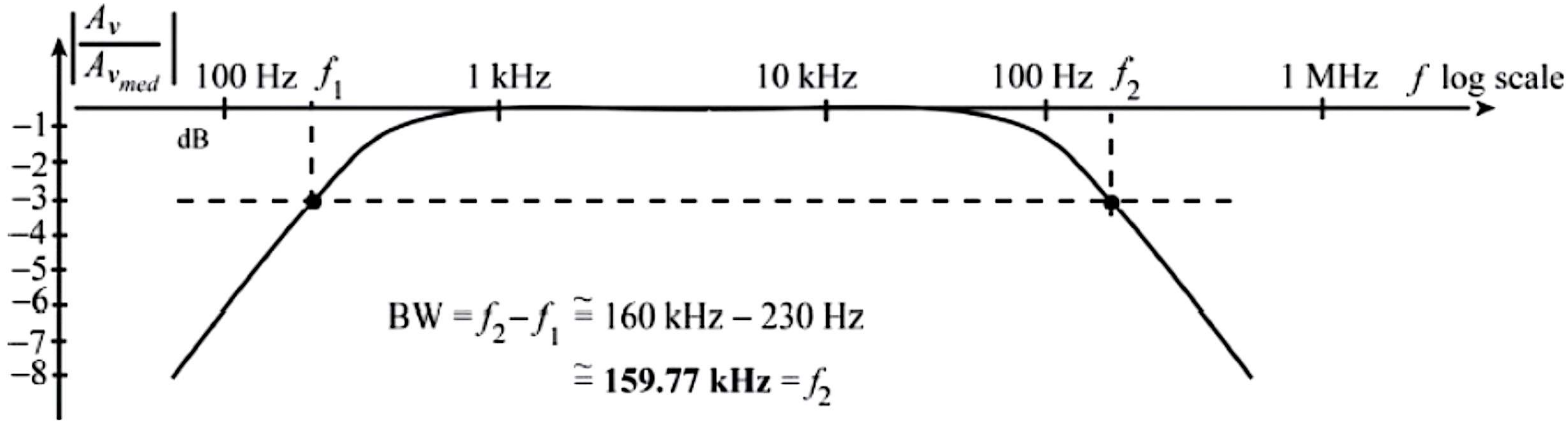
10. (a) Same shape except $A_v = 190$ is now level of 1. In fact, all levels of A_v are divided by 190 to obtain normalized plot.

$0.707(190) = \mathbf{134.33}$ defining cutoff frequencies

at low end $f_1 \cong \mathbf{230\ Hz}$ (remember this is a log scale)

at high end $f_2 \cong \mathbf{160\ kHz}$

(b)



11. (a) $|A_v| = \left|\frac{V_o}{V_i}\right| = \frac{1}{\sqrt{1+(f_1/f)^2}}$ $f_l = \frac{1}{2\pi RC} = \frac{1}{2\pi(1.2\text{ k}\Omega)(0.068\ \mu\text{F})}$

$= 1950.43\text{ Hz}$

$$|A_v| = \frac{1}{\sqrt{1+\left(\frac{1950.43\text{ Hz}}{f}\right)^2}}$$

(b)

		$A_{V_{dB}}$
100 Hz:	$\lvert A_v \rvert = 0.051$	-25.8
1 kHz:	$\lvert A_v \rvert = 0.456$	-6.81
2 kHz:	$\lvert A_v \rvert = 0.716$	-2.90
5 kHz:	$\lvert A_v \rvert = 0.932$	-0.615
10 kHz:	$\lvert A_v \rvert = 0.982$	-0.162

(c) $f_1 \cong$ **1950 Hz**

(d)(e)