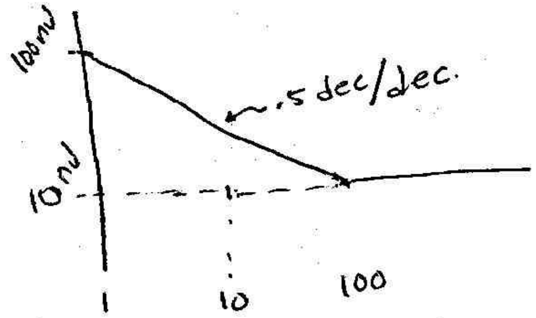
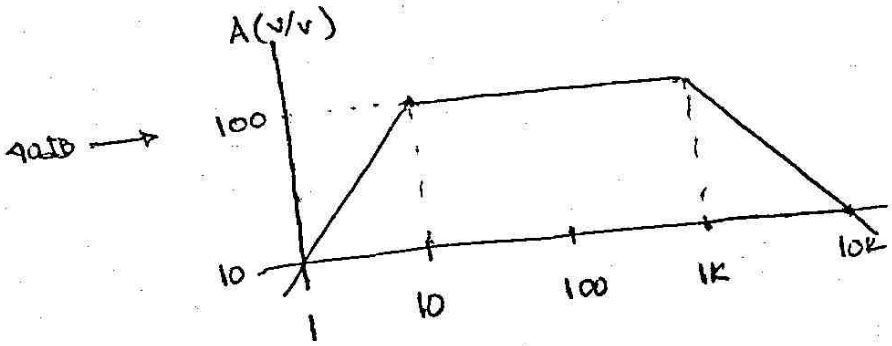
7.8

$$e_{ni} = e_{nw}\sqrt{\frac{f_{ce}}{f}+1} = 10\,nV\sqrt{\frac{100}{f_0}+1}$$



$$A_v = \frac{10f}{\sqrt{1+(f/10)^2}\,\sqrt{1+(f/1K)^2}}$$



For $f < 10\,Hz$

$$e_{no}^2 = (10nV)^2\left(\frac{100}{f}+1\right)\left(\frac{10f}{\sqrt{1+(f/10)^2}\,\sqrt{1+(f/1K)^2}}\right)^2$$

Using the asymptotes.

$$e_{no}^2 \simeq 100\times10^{-18}\left(\frac{100}{f}\right) * 100f^2$$

$$= 10^{-12} f.$$

and

$$E_{n1}^2 = \int_0^{10} 10^{-12} f\,df = 10^{-12}\,\frac{f^2}{2}\Big|_0^{10} = \frac{10^{-10}}{2}\,V^2 = \underline{\underline{5\times10^{-11}\,V^2}}$$

From 10 to 100 Hz

$$e_{no}^2 = (10\,nV)^2\left(\frac{100}{f}\right)\left(\frac{10f}{\sqrt{(f/10)^2}}\right)^2$$

$$= (10^{-18}V^2)(100)\left(\frac{100}{f}\right)(100)^2 = \frac{10^{-10}}{f}$$

$$E_{n2}^2 = \int_{10}^{100} \frac{10^{-10}}{f}\,df = (10^{-10}V^2)\ln f\Big|_{10}^{100} = (10^{-10}V^2)\ln(10)$$

$$= \underline{\underline{2.3\times10^{-10}\,V^2}}$$

For $f > 100 \to$ low pass with $f_0 = 1\text{KHZ}$

$$E_{n3} = e_{nw_0} \sqrt{f_H - f_L}$$

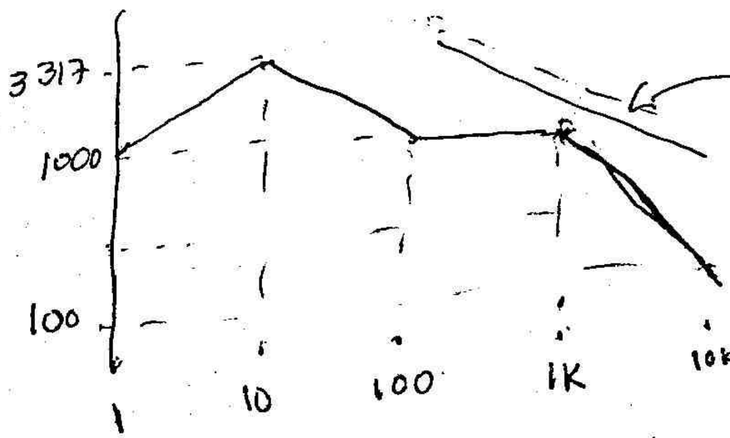
$$f_H = 1.57 f_0 = 1570 \text{ HZ}$$

$$e_{nw_0} = 1000 \text{ nV}$$

$$E_{n3} = 10^6 (10^{-18} V^2)(1470) = 1.47 \times 10^{-9} V^2$$

$$E_n = \sqrt{5 \times 10^{-11} + 2.3 \times 10^{-10} + 1.47 \times 10^{-9}} \quad \checkmark$$

$$E_n = 41.83 \mu V$$



pink noise tangent

$$(10^3 \text{ nV}) \sqrt{1.57 \times 10^3}$$

$$= 39.6 \mu V$$