Week 7 Questions and Answer Key

- Day 1, Review

- Day 2, Test (Integrals Applied)

- Day 3, questions 1-5

- Day 4, questions 6-10

- Day 5, questions 11-15

1. Given the equation $m^{2.3} = 25$, solve for m.

   $m = 4.053$

2. Given the equation $x = log_3 2187$, solve for x.

   $x = 7$

3. Given the equation $L_1 = ((L_2)^2)^{\frac{1}{3}}$, solve for L_2.

   $L_2 = \sqrt{(L_1)^3}$

4. Given the equation $I = (\frac{V}{L})te^{sct}$, solve for sc.

   $sc = \frac{LN(\frac{IL}{Vt})}{t}$

5. Given the equation $I_K = AT^2 e^{\frac{-B}{t}}$, solve for A and B.

   $A = \frac{I_K}{T^2 e^{\frac{-B}{t}}}$
   $B = -t(LN(\frac{I_K}{AT^2}))$

6. Given the equation $L_1 = ((L_2)^2)^{\frac{1}{3}}$, solve for L_2.

   $L_2 = \sqrt{(L_1)^3}$

7. An amplifier is rated as having a $90dB$ gain. What power ratio does this represent?

$\frac{P_{out}}{P_{in}} = 10^9$

8. An amplifier has a gain of $60dBm$. What is the output power?

$P_{out} = 1KW$

9. The manufacturer of a high fidelity $100w$ power amplifier claimed that hum and noise in the amplifier is $90dB$ below the full power output. How much hum and noise power does this represent?

noise and hum $= 100nW$

10. A network has a loss of $80dB$. What power ratio corresponds to this loss?

$\frac{P_{out}}{P_{in}} = 10^{-8}$

11. An amplifier has a input impedance of 600Ω and a output impedance of $6K\Omega$. The power out is $30W$ when $1.9v$ is applied across the input:

   (a) What is the voltage gain of the amplifier?

   $\Delta_V = 223.297$

   (b) What is the power gain of the amplifier in dB?

   $\Delta_P = 36.978dB$

   (c) What is the input power?

   $P_{in} = 6.017mW$

12. The noise level of a telephone line used for wired music programs is $60dB$ down from the program level of $12.5mW$. How much noise power is represented by this level?

noise $= 12.5nW$

13. A crystal microphone is rated at $-80dB$. There is onhand a final AF amplifier rated at $60dB$. How much gain must be provided by a preamp in order to drive the final amplifier to full output if a attenuator pad between the microphone and the preamp has a loss of $20dB$?

    preamp gain = 100dB

14. An amplifier has a normal output of $30W$. A selector switch is arranged to reduce the output in $5dB$ steps. What power output corresponds to the reduction of 5, 10, 15, 20, 25, and $30dB$?

    $-5dB = 9.487W$
    $-10dB = 3W$
    $-15dB = 0.9487W$
    $-20dB = 0.3W$
    $-25dB = 0.09487W$
    $-20dB = 0.03W$

    noise = 12.5nW

15. A two-stage video RF amp has a $300\mu V$ input signal into 75Ω. The second stage has a gain of $50dB$. When matched input-output impedances are used, the voltage output of the second stage must be $4.22V$ to allow distribution of the signal. Determine the following:

    (a) The input voltage of the second stage.

      $Vin_{second\ stage}$=13.345mv

    (b) The dB gain of the first stage.

      $\Delta_{dB} = 32.964dB$

    (c) The overall gain of the two amplifiers when all impedances are 75Ω.

      $Total\ Gain_{dB} = 82.964_{dB}$