

MAT 120

Quiz 4

Fall 2018

1. Suppose a signal has amplitude $A_1 = 2$ and then this is changed to a new amplitude $A_2 = 0.25$. What is the decibel level of the amplitude ratio A_2/A_1 ?

a) -12 b) $-8\sqrt{2}$ c) -18 d) $-6\sqrt{2}$ e) -30

Correct Answer: -18

2. A signal has amplitude A_1 , which is multiplied by some number x to give the new value A_2 , and if A_2 is multiplied by x , then the value of the amplitude is now $8A_1$. What is the decibel level of the multiplier x ?

a) 6 b) $2\sqrt{2}$ c) 18 d) 9 e) 30

Correct Answer: 9

3. If x is the frequency ratio for a tritone, then what amplitude ratio in decibels is represented by x ?

a) 6 b) $2\sqrt{2}$ c) 8 d) 3 e) 1.5

Correct Answer: 3

4. Suppose a harmonic tone has amplitude A , and fundamental frequency F , and that both A and F are increased by a factor of x . If the new tone is an equal-tempered major third above the old tone, what is the decibel level increase represented by x ?

a) 2 b) 6 c) 4 d) 5 e) 3

Correct Answer: 2

5. Suppose a harmonic tone has amplitude A , and fundamental frequency F , and that both A and F are increased by a factor of x , and that the resulting harmonic tone is represented by the Fourier series:

$$0.8 \sin(300 \cdot 2\pi t) + 0.4 \sin(600 \cdot 2\pi t) + 0.2 \sin(900 \cdot 2\pi t) + \dots$$

If the original tone has Fourier series:

$$0.4 \sin(F \cdot 2\pi t) + 0.2 \sin(2F \cdot 2\pi t) + 0.1 \sin(3F \cdot 2\pi t) + \dots$$

then what is F ?

a) 100 b) 150 c) 200 d) 250 e) 300

Correct Answer: 150

6. Suppose that harmonic tone T_1 has amplitude A_1 , and fundamental frequency F_1 , and harmonic tone T_2 has amplitude A_2 , and fundamental frequency F_2 , and that both amplitude and frequency are increased by a factor of x to get from T_1 to T_2 . If T_2 is an octave plus a perfect fifth above T_1 , what is the decibel level increase from T_1 to T_2 ?

a) 9.5 b) 10 c) 8.5 d) 8 e) 9

Correct Answer: 9.5

7. A decibel level x for an amplitude ratio $\frac{A_2}{A_1}$ can be computed from the formula:

a) $10^{x/10} = \frac{A_2}{A_1}$ b) $10^2 = \left(\frac{A_2}{A_1}\right)^x$ c) $10^x = 20 \frac{A_2}{A_1}$ d) $10^{x/10} = \left(\frac{A_2}{A_1}\right)^2$ e) $20^x = \frac{A_2}{A_1}$

Correct Answer: $10^{x/10} = \left(\frac{A_2}{A_1}\right)^2$

8. An equivalent formula for the decibel level x for an amplitude ratio $\frac{A_2}{A_1}$ using the natural logarithm is:

a) $\frac{20}{\ln 10} \ln\left(\frac{A_2}{A_1}\right)$ b) $\frac{\ln 20}{10} \ln\left(2 \frac{A_2}{A_1}\right)$ c) $\frac{1}{\ln 10} \ln\left(2 \frac{A_2}{A_1}\right)$ d) $\frac{\ln 20}{10} \ln\left(\frac{A_2}{A_1}\right)$ e) $\frac{\ln 10}{20} \ln\left(\frac{A_2}{A_1}\right)$

Correct Answer: $\frac{20}{\ln 10} \ln\left(\frac{A_2}{A_1}\right)$