

Math 1613 - Trigonometry

Written Assignment 5 - Due 2019.07.07

Directions: Please answer the following question in complete sentences. Be sure to label all geometric objects in any illustrations (if any). I will accept an answer in a scanned image format, as a pdf, or as a picture taken and sent from your awesome smart phone.

Question: Sound is a result of waves applying pressure to a person's eardrum. For a pure sound wave radiating outward in a spherical shape, the trigonometric function

$$P = \frac{a}{r} \cos\left(\frac{2\pi r}{\lambda} - ct\right)$$

can be used to model the sound pressure at a radius of r feet from the source, where t is time in seconds, λ is length of the sound wave in feet, c is speed of sound in feet per second, and a is the maximum sound pressure at the source measured in pounds per square foot. Let $\lambda = 4.9$ ft and $c = 1026$ ft per sec.

(a) Let $a = 0.4$ lb per ft². Graph the sound pressure at distance $r = 10$ ft from its source for $0 \leq t \leq 0.05$. Describe P at this distance.

(b) Now let $a = 3$ and $t = 10$. Graph the sound pressure for $0 \leq r \leq 20$. Describe the how the pressure P changes as the radius goes from $r = 0$ to $r = 20$.

(c) Suppose a person stands at a radius r so that $r = n\lambda$, where n is a positive integer. Use the difference identity for cosine to simplify P in this situation.