

# Math 1613 - Trigonometry

## Written Assignment 5 - Due 2017.07.09

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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,  $\lambda$  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 ft<sup>2</sup>. 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.