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## PHYS 1210 Discussion 11. Waves

1. A wave with amplitude  $A$  and frequency  $f$  has propagation speed  $v$ .
  - A. In terms of  $f$  and  $v$ , what is its period  $T$ ?
  - B. In terms of  $f$  and  $v$ , what is its wavelength  $\lambda$ ?
  - C. In terms of  $f$  and  $v$ , what is its angular wavenumber  $k$ ?
  - D. In terms of  $f$  and  $v$ , what is its angular frequency  $\omega$ ?
  - E. In terms of  $A$ ,  $f$ , and  $v$ , what is the equation of the wave?
2. A wave has an amplitude of 20 cm, a wavelength of 1.60 m, and a propagation speed of 3.20 m/s in the positive  $x$  direction.
  - A. What is its frequency?
  - B. What is its period?
  - C. What is its angular frequency?
  - D. What is its angular wavenumber?
  - E. At time  $t = 0$  the medium at position  $x = 0$  is at its maximum displacement  $y = 20$  cm. Find the equation describing this wave.
3. I said in class that two waves that have opposite propagation directions but are equal in all other aspects combine to form a standing wave.
  - A. Show this by adding together the two waves  $y = A \cos(kx - \omega t)$  and  $y = A \cos(kx + \omega t)$ , expanding the angle sum formulas, and simplifying.
  - B. What is the repeat distance of this standing wave?
  - C. What is the repeat time of this standing wave?
4. Two sound waves of slightly different frequency reach the ear, one individually causing displacements of  $y = A \cos([\omega + \delta]t)$  and the other  $y = A \cos([\omega - \delta]t)$ .
  - A. Add their two displacements together, expand the angle sum and difference, and simplify.
  - B. What is the frequency of the combination?
  - C. How does the displacement vary with time?