Home Assignment - 3

① The wave function of a standing wave is given by

$$y = (2A \sin kx) \cos \omega t$$

Find the position of nodes and antinodes

② Two waves travelling in opposite directions produce a standing wave. The individual wave functions are

$$y_1 = 4.0 \sin (3.0x - 2.0t)$$

$$y_2 = 4.0 \sin (3.0x + 2.0t)$$

x, y are measured in centimeters and t is in seconds

i) Find the amplitude of the element of the medium located at $x = 2.3$ cm

ii) Find the positions of the nodes and antinodes if one end of the string is at $x = 0$

Q-3 Two waves simultaneously present on a long string have a phase difference ϕ between them so that a standing wave formed from their combination is described by

$$y(x,t) = 2A \sin\left(kx + \frac{\phi}{2}\right) \cos\left(\omega t - \frac{\phi}{2}\right)$$

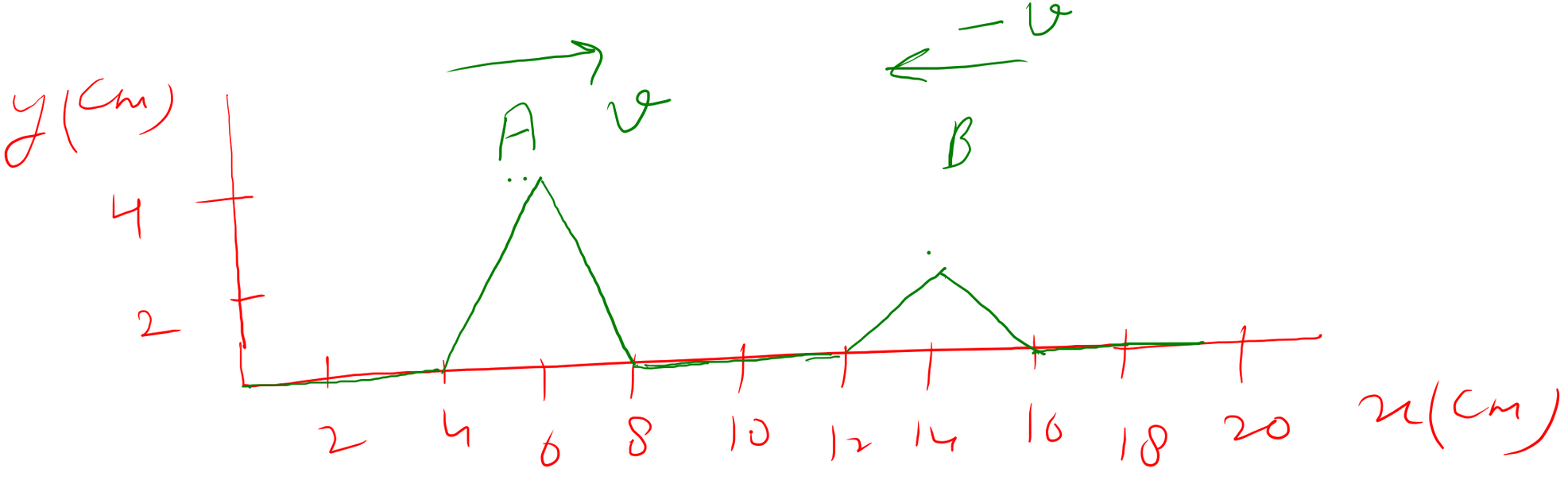
(a) Despite the presence of the phase angle ϕ, is it still true that the nodes are one-half wavelength apart?

Explain

(b) Are the nodes different in any way from the way they would be if ϕ were zero.

Explain

Q Two wave pulses A and B are moving in opposite directions, each with a speed $v = 2.00$ cm/s. The amplitude of A is twice the amplitude of B as shown in figure at $t = 0$. Sketch the resultant wave at $t = 1.00$ s, 2.00 s, 3.00 s.



Q Two waves on one string are described by the wave functions

$$y_1 = 3.0 \cos(4.0x - 1.6t)$$

$$y_2 = 4.0 \sin(5.0x - 2.0t)$$

(x, y are in centimeters, t is in seconds)

Find the superposition of the waves $y_1 + y_2$ at points

(a) $x = 1.\omega$, $t = 1.\omega$

(b) $x = 0.5\omega$, $t = 0$

(c) $x = 1.\omega$, $t = 0.5\omega$