

CID \_\_\_\_\_

### Challenge Problem 4

Two waves travel of different amplitudes travel in opposite directions along a string. The functional form of the waves is:

$$y_1(x,t) = A_1 \cos(kx - \omega t)$$

$$y_2(x,t) = A_2 \cos(kx + \omega t)$$

Plot the speed of the resultant wave over the interval of one period. Be sure to show your work as well. (If your graph has discontinuities, it may be because of artifacts of the inverse trig functions.)

We define the speed of the wave to be the speed of the maximum located at the origin at time  $t = 0$ .

Use the following values:

$$A_1 = 5.15 \text{ mm}$$

$$A_2 = 1.20 \text{ mm}$$

$$k = 35.0 \text{ cm}^{-1}$$

$$f = 1320 \text{ Hz}$$

These trig identities may be helpful:

$$\cos(a \pm b) = \cos a \cos b \mp \sin a \sin b$$

$$\sin(a \pm b) = \sin a \cos b \pm \cos a \sin b$$

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