HW 12-6 Soln)

We assume that the strings are fixed at each end.

Since the two strings are under the same tension and are otherwise identical, the longer string has the lower fundamental frequency. If the beat frequency of the two n = 4 harmonics is 6 Hz, the longer string's harmonic is 394 Hz. The wave speed is given as 120 m/s.

Short string: $f_4 = \frac{4(120)}{4L} = 400$ Hz

Long string: $f_4 = \frac{4(120)}{4(L+\Delta L)} = 394$ Hz

Probably the easiest thisg to do is solve for L:

$$\frac{4(120)}{4L} = 400 \quad L = 0.3 \text{ m} \quad .$$

Likewise,

$$\frac{4(120)}{4(L + \Delta L)} = 394 \quad L + \Delta L = 0.3046 \text{ m}$$

and so $\Delta L =$ 0.0046 m.