Task. A sinusoidal wave is described by $y(x,t) = 4.0\sin(4.20x - 5.95t)$ cm, where x is the position along the wave propagation. Determine the amplitude, wave number, wavelength, frequency and velocity of the wave.

Solution. In general, a sinusoidal wave has the following equation:

$$y(x,t) = A\sin(kx - \omega t),$$

where A is the amplitude, k is the wave number and ω is the angular frequency.

There is no information about the measures of x and t. Therefore let us denote the measure of x by L and the measure of time t by T. Then

$$A = 4.0 \; cm, \qquad k = 4.20 \; L^{-1}, \qquad \omega = 5.95 \; T^{-1}.$$

Recall that

$$k = \frac{2\pi}{\lambda}, \qquad \omega = 2\pi f,$$

where λ is the wavelength, and f is the frequency. Therefore

$$\lambda = \frac{2\pi}{k} = \frac{2 \cdot 3.14}{4.20} \approx 1.50 \; L,$$

$$f = \frac{\omega}{2\pi} = \frac{5.95}{2 \cdot 3.14} \approx 0.95 \; T^{-1}.$$

The velocity of the wave is given by the formula:

$$v = \frac{\omega}{k} = \frac{5.95}{4.20} \approx 1.42 \; L/T.$$

Answer.

$$\text{amplitude: } A = 4.0 \; cm,$$
$$\text{wave number: } k = 4.20 \; L^{-1},$$
$$\text{wavelength: } \lambda = 1.50 \; L,$$
$$\text{frequency: } f = 0.95 \; T^{-1},$$
$$\text{velocity: } v = 1.42 \; L/T.$$