11.4

The speed of the wave is given by $v = 10\,\mathrm{m}/2.0\,\mathrm{s} = 5.0\,\mathrm{m/s}$. Thus from Eq. (11.1)

$$f = \frac{v}{\lambda} = \frac{5.0\,\mathrm{m/s}}{0.50\,\mathrm{m}} = 10\,\mathrm{Hz}.$$

11.8

Again, compare the given waveform $y = (10\,\mathrm{cm})\sin(2\pi x/0.0314\,\mathrm{cm})$ with the expr
Eq. (11.2) to obtain $\lambda = 0.0314\,\mathrm{cm} = 3.14 \times 10^{-4}\,\mathrm{m}$. Thus the period is

$$T = \frac{1}{f} = \frac{\lambda}{v} = \frac{3.14 \times 10^{-4}\,\mathrm{m}}{4.00\,\mathrm{m/s}} = 7.85 \times 10^{-5}\,\mathrm{s} = 78.5\,\mu\mathrm{s}.$$

11.10

Start with Eq. (11.3), $\psi = A\sin[(2\pi/\lambda)(x - vt)]$. Since $k = 2\pi/\lambda$ we have

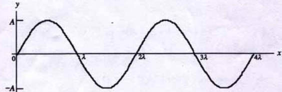
$$\psi = A\sin\frac{2\pi}{\lambda}(x - vt) = A\sin k(x - vt) = A\sin(kx - kvt),$$

where in the last expression $kv = (2\pi/\lambda)v = 2\pi/(\lambda/v) = 2\pi/T = 2\pi f = \omega$. So

$$\psi = A\sin k(x - vt) = A\sin(kx - \omega t).$$

11.22

At $t = 0$, $y = A\sin 2\pi(x/\lambda)$ and it has the corresponding values of 0, $0.707A$, A,
$-A$, $-0.707A$, 0. The profile is plotted below.



By comparison, at $t = 0$ $y' = A\sin 2\pi(-x/\lambda) = -A\sin 2\pi(x/\lambda) = -y$ and
corresponding values of 0, $-0.707A$, $-A$, $0.707A$, A, $0.707A$, 0. Notice that changin
of the phase changes the sign of the sine function: $\sin(-\varphi) = -\sin\varphi$. The profiles o
are shifted 180° to one another. y' is plotted below.