15.6. A certain transverse wave is described by

$$y(x, t) = (6.50\ \text{mm})\cos 2\pi\left(\frac{x}{28.0\ \text{cm}} - \frac{t}{0.0360\ \text{s}}\right)$$

Determine the wave's (a) amplitude; (b) wavelength; (c) frequency; (d) speed of propagation; (e) direction of propagation.

15.8. A water wave traveling in a straight line on a lake is described by the equation

$$y(x, t) = (3.75\ \text{cm})\cos(0.450\ \text{cm}^{-1}\,x + 5.40\ \text{s}^{-1}\,t)$$

where y is the displacement perpendicular to the undisturbed surface of the lake. (a) How much time does it take for one complete wave pattern to go past a fisherman in a boat at anchor, and what horizontal distance does the wave crest travel in that time? (b) What are the wave number and the number of waves per second that pass the fisherman? (c) How fast does a wave crest travel past the fisherman, and what is the maximum speed of his cork floater as the wave causes it to bob up and down?

15.6 $y(x,t) = A\cos\left(\frac{2\pi}{\lambda}x - \frac{2\pi}{T}t\right)$

$= (6.50\,\text{mm})\cos\left(\frac{2\pi x}{28.0\,\text{cm}} - \frac{2\pi t}{0.0360\,s}\right)$

(a) $A = 6.50\,\text{mm}$ (b) $\lambda = 28.0\,\text{cm}$

(c) $f = 1/T = 1/0.0360\,s = 27.8\,\text{Hz}$

(d) $v = \lambda f = 778\,\text{cm/s}$

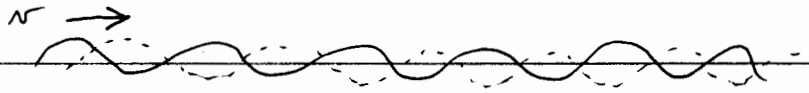
(e) dir: to the right

15.8 $y(x,t) = 3.75\,\text{cm}\cos(0.450/\text{cm}\,x + 5.40/s\,t)$

$A = 3.75\,\text{cm}$

$k = 0.450\,\text{cm}^{-1}$

$\omega = 5.40\,s^{-1}$



$T = \frac{2\pi}{\omega} = 1.16\,s$

$\lambda = \frac{2\pi}{k} = 13.96\,\text{cm}$

$k = 0.450\,\text{cm}^{-1}$

$f = \omega/2\pi = 0.859\,\text{Hz}$

$v = \lambda f = \frac{2\pi}{k}\cdot\frac{\omega}{2\pi} = 12\,\text{cm/s}$

$v_y = \frac{\partial y}{\partial t} = -\omega A\sin(kx + \omega t)$

$v_{y,\max} = \omega A = (5.40/s)(3.75\,\text{cm}) = 20.25\,\text{cm/s}$