50. From the $x = 0$ plot (and the requirement of an antinode at $x = 0$), we infer a standing wave function of the form

$$y = -(0.04)\cos(kx)\sin(\omega t) \quad \text{where} \quad \omega = \frac{2\pi}{T} = \pi \text{ rad/s}$$

with length in meters and time in seconds. The parameter k is determined by the existence of the node at $x = 0.10$ (presumably the *first* node that one encounters as one moves from the origin in the positive x direction). This implies $k(0.10) = \pi/2$ so that $k = 5\pi$ rad/m.

(a) With the parameters determined as discussed above and $t = 0.50$ s, we find

$$y = -0.04\ \cos(kx)\sin(\omega t) = 0.04 \text{ m} \quad \text{at } x = 0.20 \text{ m} .$$

(b) The above equation yields zero at $x = 0.30$ m.

(c) We take the derivative with respect to time and obtain

$$u = \frac{dy}{dt} = -0.04\,\omega\ \cos(kx)\cos(\omega t) = 0 \quad \text{at } t = 0.50 \text{ s}$$

where $x = 0.20$ m.

(d) The above equation yields $u = -0.126\,\text{m/s}$ at $t = 1.0$ s.

(e) The sketch of this function at $t = 0.50$ s for $0 \le x \le 0.40$ m is shown.