4.9. Model: Use the particle model for the puck.

Visualize: Please refer to Figure EX4.9

Solve: (a) Since the v_x vs t and v_y vs t graphs are straight lines, the puck is undergoing constant acceleration along the x- and y- axes. The components of the puck's acceleration are

$$a_x = \frac{dv_x}{dt} = \frac{\Delta v_x}{\Delta t} = \frac{(-10 \text{ m/s} - 10 \text{ m/s})}{10 \text{ s} - 0 \text{ s}} = -2.0 \text{ m/s}^2$$

$$a_y = \frac{(10 \text{ m/s} - 0 \text{ m/s})}{(10 \text{ s} - 0 \text{ s})} = 1.0 \text{ m/s}^2$$

The magnitude of the acceleration is $a = \sqrt{a_x^2 + a_y^2} = 2.2 \text{ m/s}^2$.

(b) The puck is undergoing constant acceleration in both the x and y directions. Identify from the graphs $v_{i_x} = 10$ m/s, $v_{i_y} = 0$ m/s. Since the puck starts at the origin, $x_i = y_i = 0$ m, and set $t_i = 0$ s. Using kinematics,

$$x = 0 \text{ m} + (10 \text{ m/s})t + \tfrac{1}{2}(-2.0 \text{ m/s}^2)t^2$$

$$y = 0 \text{ m} + 0 \text{ m/s} + \tfrac{1}{2}(1.0 \text{ m/s}^2)t^2$$

The distance from the origin at time t is $r = \sqrt{x^2 + y^2}$. The table below shows the values of x, y, and r at the times $t = 0$, 5, 10 s.

	x	y	R
$t = 0$ s	0 m	0 m	0 m
5 s	25 m	12.5 m	28 m
10 s	0 m	50 m	50 m

Assess: The puck turns around at $t = 5$ s in the x direction, and constantly accelerates in the y direction. Traveling 50 m from the starting point in 10 s is reasonable.