6.8. Visualize: Please refer to Figure EX6.8.

Solve: We can use the constant slopes of the three segments of the graph to calculate the three accelerations. For t between 0 s and 3 s,

$$a_x = \frac{\Delta v_x}{\Delta t} = \frac{12 \text{ m/s} - 0 \text{ s}}{3 \text{ s}} = 4 \text{ m/s}^2$$

For t between 3 s and 6 s, $\Delta v_x = 0$ m/s, so $a_x = 0$ m/s^2. For t between 6 s and 8 s,

$$a_x = \frac{\Delta v_x}{\Delta t} = \frac{0 \text{ m/s} - 12 \text{ m/s}}{2 \text{ s}} = -6 \text{ m/s}^2$$

From Newton's second law, at $t = 1$ s we have

$$F_{\text{net}} = ma_x = (2.0 \text{ kg})(4 \text{ m/s}^2) = 8 \text{ N}$$

At $t = 4$ s, $a_x = 0$ m/s^2, so $F_{\text{net}} = 0$ N. At $t = 7$ s,

$$F_{\text{net}} = ma_x = (2.0 \text{ kg})(-6.0 \text{ m/s}^2) = -12 \text{ N}$$

Assess: The magnitudes of the forces look reasonable, given the small mass of the object. The positive and negative signs are appropriate for an object first speeding up, then slowing down.