4.7. Visualize: Refer to Figure EX4.7.
Solve: From the figure, identify the following:

$$x_1 = 0 \text{ m} \qquad y_1 = 0 \text{ m}$$
$$x_2 = 2000 \text{ m} \qquad y_2 = 1000 \text{ m}$$
$$v_{1x} = 0 \text{ m/s} \qquad v_{1y} = 200 \text{ m/s}$$
$$v_{2x} = 200 \text{ m/s} \qquad v_{2y} = -100 \text{ m/s}$$

The components of the acceleration can be found by applying $v_2^2 = v_1^2 + 2a\Delta s$ for the x and y directions. Thus

$$a_x = \frac{v_{2x}^2 - v_{1x}^2}{2\Delta x} = \frac{(200 \text{ m/s})^2 - (0 \text{ m/s})^2}{2(2000 \text{ m} - 0 \text{ m})} = 10.00 \text{ m/s}^2$$

$$a_y = \frac{(-100 \text{ m/s})^2 - (200 \text{ m/s})^2}{2(1000 \text{ m} - 0 \text{ m})} = -15.00 \text{ m/s}^2$$

So $\vec{a} = (10.00\hat{i} - 15.00\hat{j}) \text{ m/s}^2$.

Assess: A time of 20 s is needed to change $v_{1x} = 0$ m/s to $v_{2x} = 200$ m/s at $a_x = 10 \text{ m/s}^2$. This is the same time needed to change v_{1y} to v_{2y} at $a_y = -15 \text{ m/s}^2$.