1. The sides of a square are all increasing uniformly at a rate of 3 inches/minute. At what rate is the area of the square increasing when the side length is 10 inches?

2. A particle moves along the graph of $y = \tan(x)$. Its velocity in the x-direction (dx/dt) is 5 units per minute. When $x = \dfrac{\pi}{4}$, what is its velocity in the y-direction (dy/dt)?

3. A car is traveling north toward an intersection at a rate of 60 mph while a truck is traveling east away from the intersection at a rate of 50 mph. Find the rate of change of the distance between the car and truck when the car is 3 miles south of the intersection and the truck is 4 miles east of the intersection.

truck $\rightarrow$

$\uparrow$
car
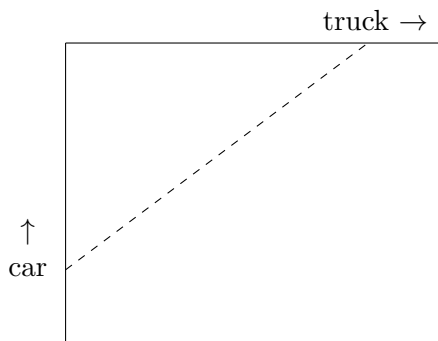
4. A rectangle of length ℓ and width w has a constant area of 1200 in^2. The side lengths are changing while keeping the area the same. Suppose that at a particular instant the length is increasing at 6 in/min and the width is decreasing at 2 in/min.

   (a) Find the dimensions of the rectangle at this instant.

   (b) At this same instant, is the length of the *diagonal* increasing or decreasing? At what rate?

5. An FBI agent with a powerful spyglass is located in a boat anchored 0.4 km offshore. A gangster under surveillance is walking along the shore. Assuming the shoreline is straight and that the gangster is walking at the rate of 2 km/hr, how fast must the FBI agent rotate the spyglass to track the gangster when the gangster is 1 km from the point on the shore nearest to the boat? (In other words, find $d\theta/dt$.)

gangster $\rightarrow$

0.4 km

θ

FBI