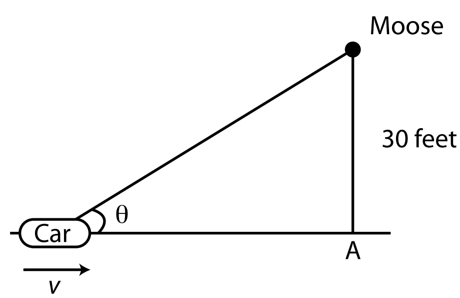
1. A ladder 15 ft long is sliding down a wall. The base of the ladder is traveling away from the wall at 1/2 ft/s. How fast is the top of the ladder slipping down the wall when the base is 5 feet from the wall?

Solution:
Let the distance between the base of the ladder and the wall at a given time t be denoted by $x(t)$. By the Pythagorean Theorem, the distance between the top of the ladder and the floor at time t is given by $y(t) = 15^2 - x(t)^2$. To find how fast the traveling away from the wall at 1/2 ft/s. How fast is the top of the ladder slipping down the wall, we need to find $y'(t)$. Notice

$$y'(t) = -2x(t)(x'(t)).$$

Since we are told that the base of the ladder is slipping away from the wall at $1/2ft/s$, we know $x'(t) = .5$ ft/s. Moreover, when the base of the ladder is 5 feet from the wall, we have that $x(t) = 5$. From this, we have that $y'(t) = -2(5)(.5) = -5$ ft/s.

2. A car is traveling along the Parks highway at v ft/sec. There is a moose standing 30 feet from point A, which is the nearest point on the highway to the moose. Let x be the distance from the car to point A, and let θ be the angle shown in the diagram below. Compute $\frac{d\theta}{dt}$ when $x = 40$ feet and $v = 100$ feet per second.



Solution:
We can see that $\theta = \arctan\left(\frac{x(t)}{30}\right)$. So

$$\frac{d\theta}{dt} = -\frac{1}{1+\left(\frac{x(t)}{30}\right)^2} \cdot x'(t)$$

So when $x(t) = 40$ and $x'(t) = -100$, we get

$$\frac{d\theta}{dt} = \frac{100}{1+\left(\frac{40}{30}\right)^2} = 36 \text{ rad/sec.}$$