1. A plane flying at a speed of 70 m/s and an altitude of 40 m has flown over a camera. If the camera is kept pointed at the plane, how fast is the camera rotating when the plane is 50 m from the camera? (The 50 m is measured from the camera directly to the plane.) Be sure to give your answer with units of measurement.

Units are m/s radians

Relation is \( \tan \theta = \frac{x}{40} \)

\[ 40 \tan \theta = x \]

\[ \frac{d}{dt} (40 \tan \theta) = \frac{dx}{dt} \]

\[ 40 \sec^2 \theta \cdot \frac{d\theta}{dt} = \frac{dx}{dt} \]

\[ 40 \left( \frac{5}{4} \right)^2 \frac{d\theta}{dt} = 70 \]

\[ \frac{d\theta}{dt} = \frac{70 \cdot 16}{40 \cdot 25} \]

\[ \frac{d\theta}{dt} = \frac{28}{25} \text{ rad/s} \]
2. A car is headed towards a typical intersection at 30 ft/s. A person is walking away from the intersection on the other street (at right angles) at 4 ft/s. How fast is the distance between them changing when the car is 5 ft from the intersection and the person is 12 ft from the intersection? In particular, is the distance increasing or decreasing?

Given rates are
\[ \frac{dy}{dt} = -30 \text{ ft/s} \]
\[ \frac{dx}{dt} = 4 \text{ ft/s} \]
Desired rate is \[ \frac{dz}{dt} = ? \]

Evaluate at \[ y = 5 \]
\[ x = 12 \]
\[ z = 13 \]

Relation is
\[ x^2 + y^2 = z^2 \]
\[ \frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}(z^2) \]
\[ 2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2z \frac{dz}{dt} \]
\[ 2(12)(4) + 2(5)(-30) = 2(13) \frac{dz}{dt} \]
\[ 96 - 300 = 26 \frac{dz}{dt} \]
\[ \frac{-204}{26} \text{ ft/s} = \frac{dz}{dt} \]

The distance is decreasing.