Try this related rates problem.
The set up is the same as our recent daily check, but it's asking for a different rate!
(See answer on next page.)

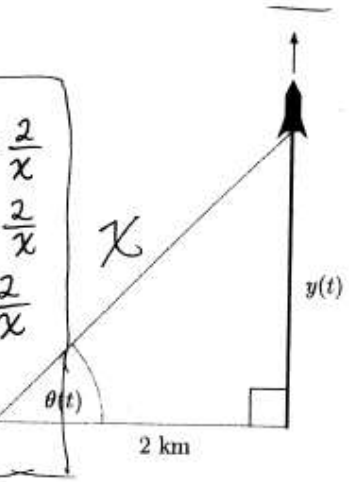
An observer watches a rocket launch from a distance of 2 kilometers. The angle of elevation θ is increasing at $\frac{\pi}{60}$ radians per second at the instant when $\theta = \frac{\pi}{4}$.

At what rate is the distance between the rocket and the observer increasing at that instant? Leave answer in exact form.

10) An observer watches a rocket launch from a distance of 2 kilometers. The angle of elevation θ is increasing at $\frac{\pi}{60}$ radians per second at the instant when $\theta = \frac{\pi}{4}$.

$\frac{d\theta}{dt} = \frac{\pi}{60}$

At what rate is the distance between the rocket and the observer increasing at that instant? (Leave answer in exact form in terms of π.)



$\cos\theta = \frac{2}{x}$

$\cos\left(\frac{\pi}{4}\right) = \frac{2}{x}$

$\frac{\sqrt{2}}{2} = \frac{2}{x}$

$\sqrt{2}\,x = 4$

$x = \frac{4}{\sqrt{2}}$

$\cos\theta = \frac{2}{x} = 2x^{-1}$

$-\sin\theta \cdot \frac{d\theta}{dt} = -2x^{-2} \cdot \frac{dx}{dt}$

$\sin\theta \cdot \frac{d\theta}{dt} = \frac{2}{x^2} \cdot \frac{dx}{dt}$

$\sin\left(\frac{\pi}{4}\right)\left(\frac{\pi}{60}\right) = \frac{2}{\left(\frac{4}{\sqrt{2}}\right)^2} \frac{dx}{dt}$

$\frac{\sqrt{2}}{2} \cdot \frac{\pi}{60} = \frac{2}{16} \frac{dx}{dt}$

$\frac{\sqrt{2}\,\pi}{120} = \frac{1}{4} \frac{dx}{dt}$

$\frac{4\sqrt{2}\,\pi}{120} = \frac{dx}{dt}$

$\frac{dx}{dt} = \frac{\sqrt{2}\,\pi}{30}$