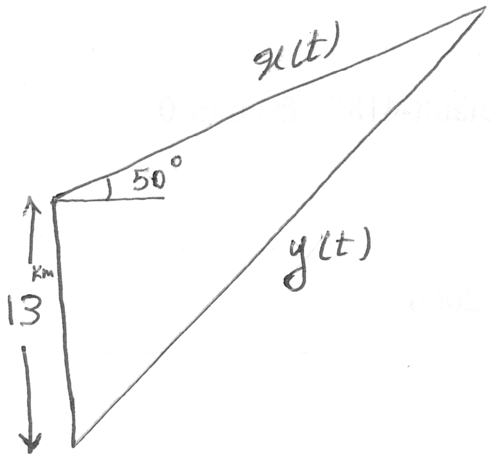
The radar question: (Values are just made up)

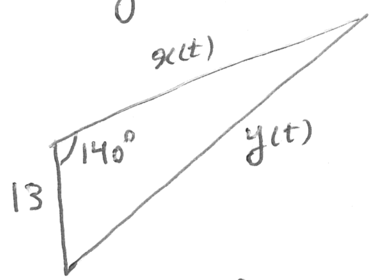
Method I -



Given: $\frac{dx}{dt} = 14$

Sought: $\frac{dy}{dt}$ at $t = 2$.

Look at this triangle



Cosine Law: $y^2(t) = x^2(t) + 13^2 - 26\,x(t)\cos(140°)$ (I)

$\xrightarrow{\frac{d}{dt} \text{ of (I)}}$ $2y(t)\frac{dy}{dt} = 2x(t)\frac{dx}{dt} - 26\cos(140°)\frac{dx}{dt}$ (II)

At $t = 2$, (II) becomes: $y(2)\left.\frac{dy}{dt}\right|_2 = x(2)\left.\frac{dx}{dt}\right|_2 - 26\cos(140°)\left.\frac{dx}{dt}\right|_2$ (III)

We know that $\frac{dx}{dt} = 14$, therefore, $\left.\frac{dx}{dt}\right|_2 = 14$, but we must find $x(2)$ and $y(2)$ as well to be able to find $\left.\frac{dy}{dt}\right|_2$.

Considering the fact that $x(t)$ is the distance of the plane after t minutes from where/when the radar got it, we can see that

$\left\{\begin{array}{l}\frac{dx}{dt} = 14 \\ x(0) = 0\end{array}\right. \longrightarrow x(t) = 14t \longrightarrow x(2) = 28 \xrightarrow{\text{From (I)}} y(2) \simeq 38.87$

Using these values, from (III) we get $\left.\frac{dy}{dt}\right|_2 \simeq 13.67$