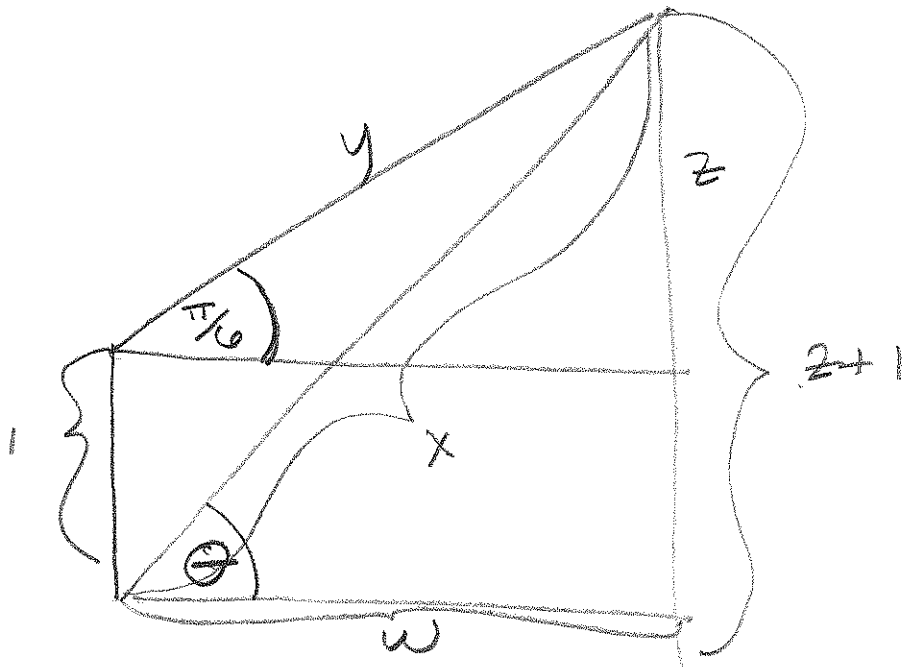

$y = y(t) = 300t$

Want $\frac{dx}{dt}$ | $t = 1\text{min} = \frac{1}{60}\text{hr}$

$\frac{z+1}{x} = \sin\theta$

$z+1 = x\sin\theta$

$x = (z+1)\csc\theta$

$x = \left(\frac{1}{2}y+1\right)\csc\theta = \left(\frac{1}{2}y+1\right)\frac{x}{w}$

$\frac{z}{y} = \sin\frac{\pi}{6} = \frac{1}{2}$

$z = \frac{1}{2}y$

$\frac{z}{w} = \tan\theta$

$z = w\tan\theta$

$\frac{1}{2}y = w\tan\theta = \left(y\ \ \frac{\pi}{6}\right)$

$$\frac{w}{y} = \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

$$w = \frac{\sqrt{3}}{2}y$$

$$\frac{z+1}{w} = \tan\theta$$

$$w^2 + (z+1)^2 = x^2 \quad \text{Aha!}$$

$$2ww' + 2(z+1)z' = 2xx'$$

Want x'

$$\frac{w}{y} = \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2} \Longrightarrow \boxed{w = \frac{\sqrt{3}}{2}y}$$

$$w' = \frac{\sqrt{3}}{2}y' = \frac{\sqrt{3}}{2}\cdot 300$$

$$\boxed{w' = 150\sqrt{3}\ \frac{km}{hr}}$$

$$\boxed{z = \frac{1}{2}y} \Longrightarrow z' = \frac{1}{2}y'$$

$$z' = \frac{1}{2}(300) = 150\ \frac{km}{hr} = z'$$

$t = 1\ min$

~~$x^2 = \left(\frac{\sqrt{3}}{2}y\right)^2 + \left(\frac{1}{2}y + 1\right)^2$~~

$$y\big|_{t=\frac{1}{60}} = 5$$

$y = 5 \Longrightarrow \boxed{w = \frac{5\sqrt{3}}{2},\ z = \frac{5}{2}}$

$$\therefore\ x^2 = \left(\frac{5\sqrt{3}}{2}\right)^2 + \left(\frac{5}{2}+1\right)^2 = \frac{25\cdot 3}{4} + \left(\frac{7}{2}\right)^2$$

$t = 1\ min$

$= \frac{75}{4} + \frac{49}{4} = \frac{124}{4} = \frac{62}{2} = 31 = x^2$

$\Longrightarrow x = \sqrt{31}$ when $t = 1$ min

$x x' = ww' + (z+1)z'$

$\sqrt{31}\, x' = \frac{5\sqrt{3}}{2} \cdot 150\sqrt{3} + \left(\frac{5}{2}+1\right)(150)$

~~$z = \frac{1}{2}y = \frac{5}{2}$~~

$= 5 \cdot 3 \cdot 75 + \left(\frac{7}{2}\right)(150)$

$= 1125 + 525$

$= 1650 = \sqrt{31}\, x'$

$x' = \frac{1650}{\sqrt{31}} \approx 296.3487483$

≈ 296 km/hr

Woo-Hoo!

Text uses Law of Cosines.
Big Deal. Who remembers that?!