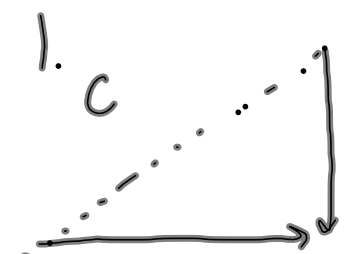
4.6.2

1.



$\frac{dB}{dt} = 45$

$\frac{dA}{dt} = 30$

$\frac{dC}{dt} = ?$

$A = \frac{1}{2}$

$B = \frac{1}{4}$

$A^2 + B^2 = C^2$

$2A\frac{dA}{dt} + 2B\frac{dB}{dt} = 2C\frac{dC}{dt}$

$2\left(\frac{1}{2}\right)(30) + 2\left(\frac{1}{4}\right)(45) = 2\left(\frac{\sqrt{5}}{4}\right)\frac{dC}{dt}$

$\left(\frac{1}{2}\right)^2 + \left(\frac{1}{4}\right)^2 = C^2$

$C = \frac{\sqrt{5}}{4}$

$\frac{dC}{dt} = \frac{105}{\sqrt{5}} \approx 46.957 \text{ mi/h}$

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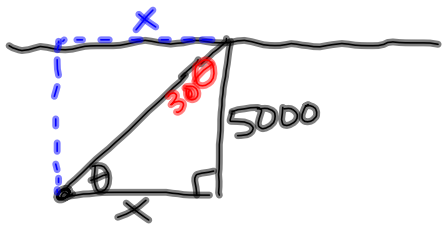
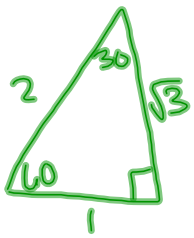
2.



$\frac{d\theta}{dt} = \frac{\pi}{4}$

$\frac{dx}{dt} = ?$

$\theta = 60°$



$\tan\theta = \frac{5000}{x}$

$\sec^2\theta\frac{d\theta}{dt} = \frac{-5000}{x^2}\frac{dx}{dt}$

we don't know x

$\tan\theta = \frac{x}{5000}$

$\sec^2\theta\frac{d\theta}{dt} = \frac{1}{5000}\frac{dx}{dt}$

$\left(\frac{2}{\sqrt{3}}\right)^2\left(\frac{\pi}{4}\right) = \frac{1}{5000}\frac{dx}{dt}$

$\frac{dx}{dt} = 5000\left(\frac{2}{\sqrt{3}}\right)^2\left(\frac{\pi}{4}\right)$

$\approx 5235.988 \text{ ft/s}$

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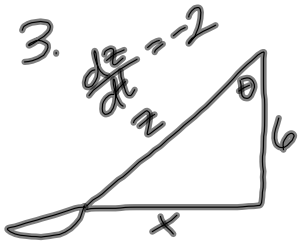
3. $\frac{dz}{dt} = -2$



$z = 10$

$\frac{dx}{dt} = ?$

$x^2 + 6^2 = 10^2$

$x = 8$

A. $x^2 + b^2 = z^2$

$2x\frac{dx}{dt} = 2z\frac{dz}{dt}$

$2(8)\frac{dx}{dt} = 2(10)(-2)$

$\frac{dx}{dt} = -\frac{40}{16} = -2.5 \text{ ft/s}$

B. $\frac{d\theta}{dt} = ?$

$\tan\theta = \frac{x}{6}$

$\sec^2\theta\frac{d\theta}{dt} = \frac{1}{6}\frac{dx}{dt}$

$\left(\frac{10}{6}\right)^2\frac{d\theta}{dt} = \frac{1}{6}(-2.5)$

$\frac{d\theta}{dt} = \frac{1}{6}(-2.5)\left(\frac{36}{100}\right) = -.15 \text{ rad/s}$

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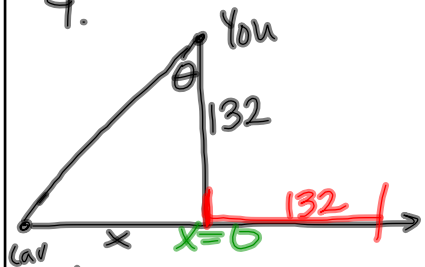
4.



$\frac{dx}{dt} = 264$

$\frac{d\theta}{dt} = ?$

$\frac{1}{2}$ sec later:

$\frac{d\theta}{dt} = \frac{1}{\left(\frac{132}{132}\right)^2 + 1} \cdot \frac{1}{132}(264)$

$= 1 \text{ rad/sec}$

$* \tan\theta = \frac{x}{132}$

~~$\sec^2\theta\frac{d\theta}{dt} = \frac{1}{132}\frac{dx}{dt}$~~

we don't know hyp.

$\theta = \tan^{-1}\left(\frac{x}{132}\right)$

$\frac{d\theta}{dt} = \frac{1}{\left(\frac{x}{132}\right)^2 + 1} \cdot \frac{1}{132}\frac{dx}{dt}$

$\frac{d\theta}{dt} = \frac{1}{\left(\frac{0}{132}\right)^2 + 1} \cdot \frac{1}{132}(264)$

$\frac{d\theta}{dt} = 2 \text{ rad/s}$

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