November 2, 2022

Related Rates 3

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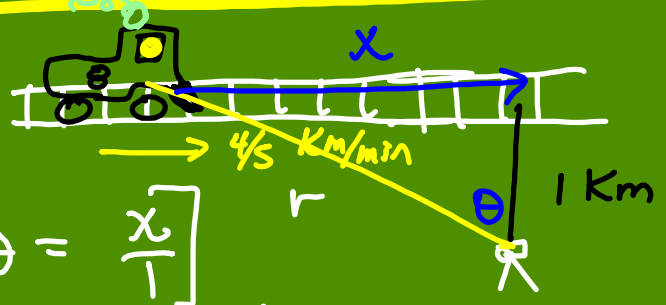

$\frac{d}{dt}\left[\tan\theta = \frac{x}{1}\right]$

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

$\left(\sec \pi/3\right)^2 \frac{d\theta}{dt} = -\frac{4}{5}$

$(2)^2 \frac{d\theta}{dt} = -\frac{4}{5}$

$\frac{1}{4} \frac{d\theta}{dt} = -\frac{4}{5} \cdot \frac{1}{4}$

$\frac{d\theta}{dt} = -\frac{1}{5}$ rad/min

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$\frac{2}{8} = \frac{r}{h}$

$\frac{2h}{8} = 8r$

$\frac{h}{4} = r$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi\left(\frac{h}{4}\right)^2 h$

$V = \frac{1}{3}\pi \frac{h^2}{16} \cdot h$

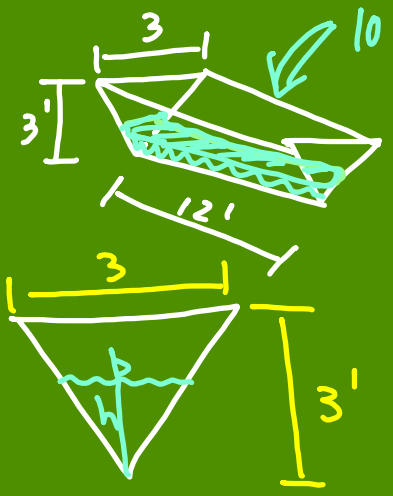
$\frac{d}{dt}\left[V = \frac{1}{48}\pi h^3\right]$

$\frac{dV}{dt} = \frac{1}{16}\pi h^2 \frac{dh}{dt}$

$-3 = \frac{1}{16}\pi(5)^2 \frac{dh}{dt}$

$\frac{16}{25\pi} \quad -3 = \frac{25\pi}{16}\frac{dh}{dt}$

$-\frac{48}{25\pi}\ \frac{in}{s} = \frac{dh}{dt}$



10 ft³/min

Find $\frac{dh}{dt}$.

$V = \frac{1}{2}bhl$

$V = \frac{1}{2}bh(12)$

$V = 6bh$

$\frac{3}{3} = \frac{b}{h}$

$3b = 3h$

$b = h$

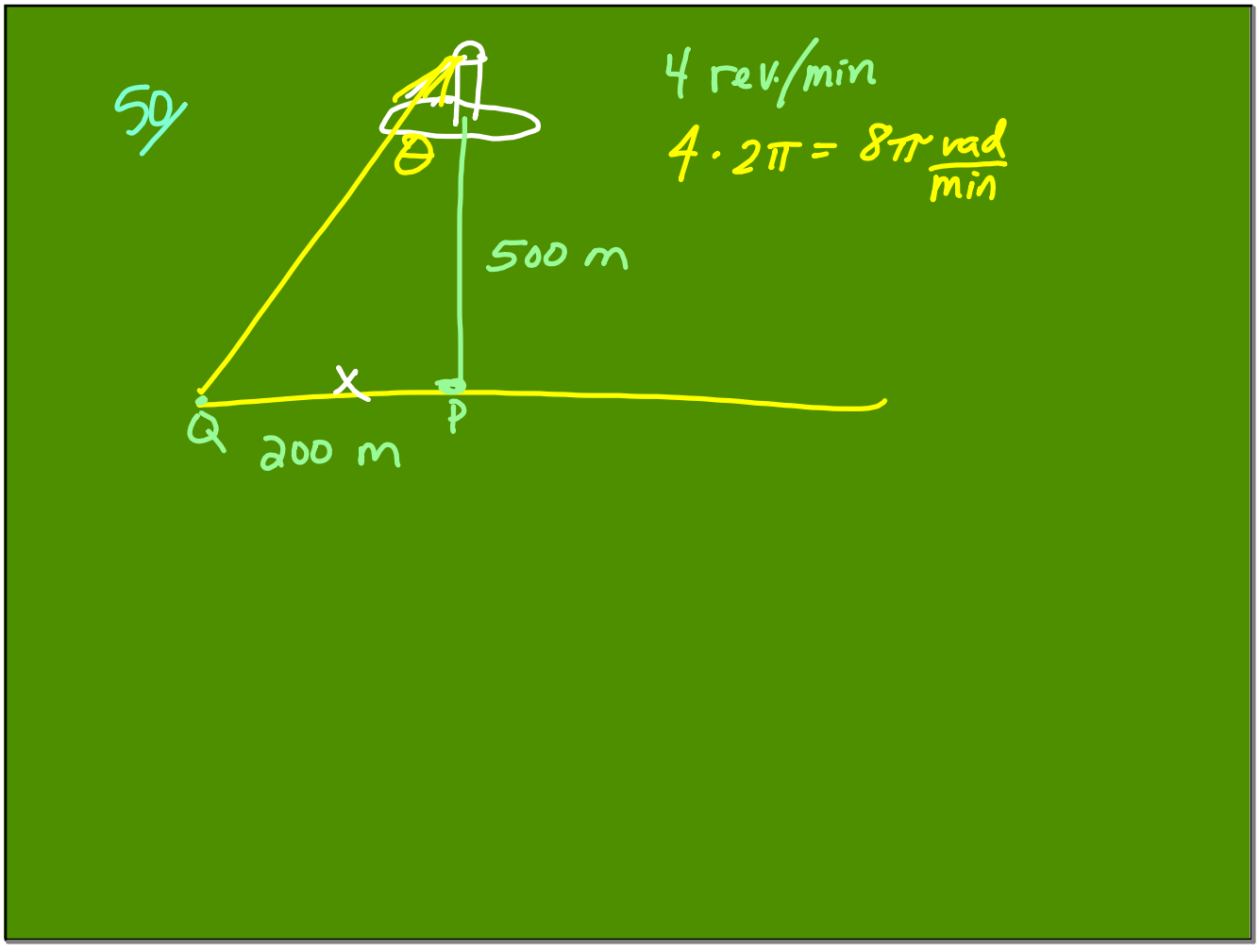
$V = 6h^2$

$\frac{dV}{dt} = 12h\frac{dh}{dt}$

$10 = 12(2)\frac{dh}{dt}$

$\frac{10}{24} = 24\frac{dh}{dt}$

$\frac{5}{12}\ \frac{ft}{min} = \frac{dh}{dt}$


5g
θ
4 rev/min
4 · 2π = 8π rad/min
500 m
x
Q
P
200 m