HW3-9:

② $y = 3x^2 - 1$

$\frac{dy}{dt} = 6x\frac{dx}{dt}$

$19 \times 29$

$x = 456$

① $x^2 + y^2 = 34$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt}$

$-18 + 10x = 0$

$x = 18/10 = 1.8$

③ $z^2 = x^2 + y^2$

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

$\frac{dz}{dt} = \frac{x}{z}\frac{dx}{dt} + \frac{y}{z}\frac{dy}{dt}$

$z^2 = \sqrt{8^2 + 15^2} = \sqrt{289}$

$\frac{dz}{dt} = \frac{8(3) + 15(5)}{\sqrt{289}} = \frac{99}{\sqrt{289}}$

④ $2x^2 + 14xp + 50p^2 = 6600$

$4x\frac{dx}{dt} + 14\frac{dx}{dt}p + 14x\frac{dp}{dt} + 100p\frac{dp}{dt} = 0$

$2x^2 + 140x + 5000 = 6600$

$(x+80)(x-10) = 0$

$x = 10$ & $x = -80$

$\frac{dx}{dt}(4x + 14p) + 14x\frac{dp}{dt} + 100p\frac{dp}{dt}$

$\frac{dx}{dt}(180) = 280 + 2000(-1)$

$\frac{dx}{dt} = \frac{-2280}{180} = \frac{-38}{3} = -12.667$

⑥ $V = IR$:

$\frac{dV}{dt} = \frac{dI}{dt}R + I\frac{dR}{dt}$

$\frac{dV}{dt} = -0.01$; $\frac{dR}{dt} = 0.01$; $R = 100$; $I = 0.02$

$-0.01 = \frac{dI}{dt}(100) + (0.02)(0.01)$

$I' \approx (-0.01 - (0.02)(0.01)) \div 100$

$\approx -1.02 \times 10^{-4}$ A/s

⑦ $A = \pi r^2$

$\frac{dA}{dt} = 2\pi r\frac{dr}{dt}$; $r' = 3$; $r = 75$m

$A' = 2\pi(75)(3) = 450\pi \frac{m^2}{s}$

⑧ $A = lb$; $\frac{dA}{dt} = \frac{dl}{dt}b + l\frac{db}{dt}$

$l' = 6$; $w' = 5$; $l = 30$; $w = 20$

$\frac{dA}{dt} = 6(20) + 30(5) \approx 270 \frac{cm^2}{s}$

⑩ $x^2 + y^2 = z^2$; $2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$

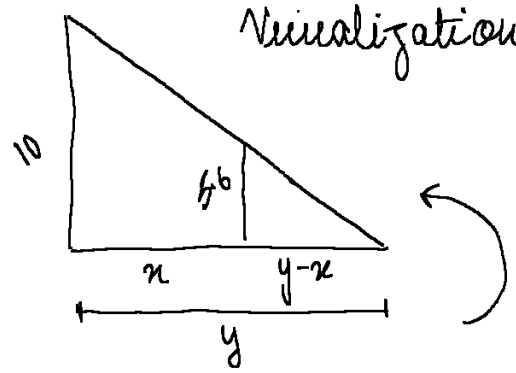
$2\sqrt{135}\frac{dx}{dt} + 2(11)(2) = 0$

then

$\frac{dx}{dt} = \frac{22}{\sqrt{135}}\frac{ft}{s}$ away from the wall.

HW39 Continued:

(11)




Visualization:

$\frac{y-x}{y} = \frac{56}{100}$; $100y - 100x = 56y$

$44y = 100x$; $y' = \frac{100}{44}\left(\frac{dx}{dt}\right) = \frac{300}{22}\ \frac{m}{s}$

(5) $V = \pi r^2 h$; $V$ = constant

$0 = 2\pi r \frac{dr}{dt} h + \pi r^2 \frac{dh}{dt}$

$\frac{dh}{dt} = 0.6\frac{m}{s}$; $r = 6m$; $\frac{dr}{dt} = ?$

$0 = 2\pi(6)\frac{dr}{dt}(5) + \pi(36)\left(\frac{6}{10}\right)$

$\frac{dr}{dt} = \frac{27}{75}\ \frac{cm}{s}$

(9) height is always 9: $x^2 + y^2 = z^2$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$;

$x\frac{dx}{dt} = z\frac{dz}{dt}$; $\frac{50\sqrt{35}(8)}{300} = \frac{dz}{dt} = \frac{4\sqrt{35}}{3}$

Part 2:

$\sin\theta = \frac{50}{z}$; $\cos\theta\frac{d\theta}{dt} = \frac{-50}{z^2}\frac{dz}{dt}$

$\frac{d\theta}{dt} = \frac{-50}{300^2}\left(\frac{4\sqrt{35}}{3}\right)\frac{300}{50\sqrt{35}} = \frac{4}{900}\ \frac{rad}{s}$