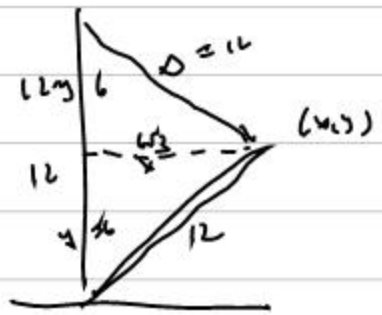
29 Sept 2015

#29



$\frac{dD}{dt} = -.2$

$\left.\frac{dx}{dt}\right|_{y=6} =$ $\left.\frac{dy}{dt}\right|_{y=6} =$

$x^2 + y^2 = 12^2$ $\quad (12-y)^2 + x^2 = D^2$

$(12-y)^2 + (12^2 - y^2) = D^2$

$2(12-y)(-1)\frac{dy}{dt} + -2y\frac{dy}{dt} = 2D\frac{dD}{dt}$

$-2(6)\frac{dy}{dt} - 12\frac{dy}{dt} = 24(-.2)$

$-24\frac{dy}{dt} = 24(-.2)$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$ $\quad \frac{dy}{dt} = .2$

$\frac{dx}{dt} = \frac{-4\frac{dy}{dt}}{x} = \frac{-(6)(.2)}{6\sqrt{3}} = \frac{-.2}{\sqrt{3}} = \frac{-1}{5\sqrt{3}}$

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39)

$\frac{dV}{dt} = k(4\pi r^2)$

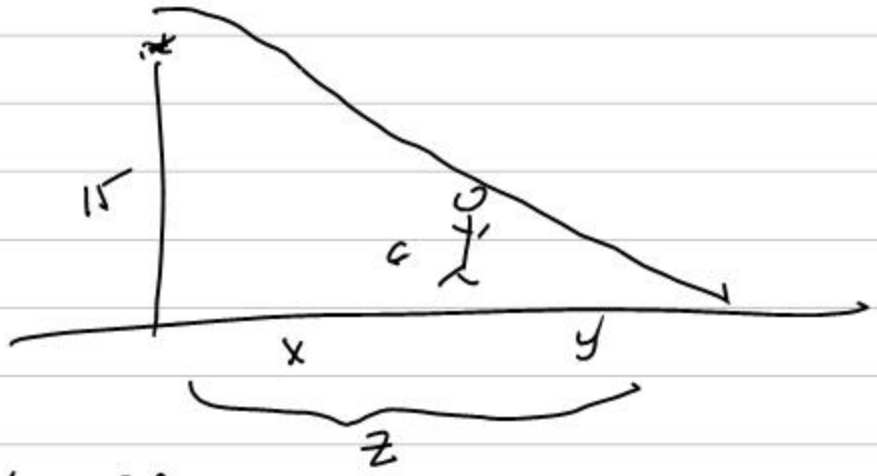
$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

$4\pi r^2\frac{dr}{dt} = k(4\pi r^2)$

$\frac{dr}{dt} = k$

35)



$\frac{dx}{dt} = 5 \text{ ft/sec}$

$\left.\frac{dz}{dt}\right|_{x=10} = \frac{25}{3} \text{ ft/sec}$

$$\frac{z-x}{6} = \frac{z}{15}$$

$$5z - 5x = 2z$$

$$3z = 5x$$

$$3\frac{dz}{dt} = 5\frac{dx}{dt}$$

$$\frac{dz}{dt} = \frac{25}{3}$$

$$\frac{y}{6} = \frac{y+x}{15}$$

$$5y = 2y + 2x$$

$$3y = 2x$$

$$3\frac{dy}{dt} = 2\frac{dx}{dt}$$

$$\frac{dy}{dt} = \frac{2(5)}{3} = \frac{10}{3}$$

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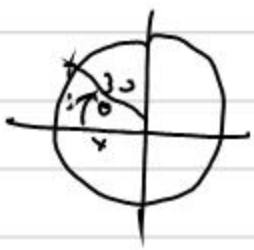
47) $\frac{d\theta}{dt} = 10 \frac{\text{rev}}{\text{min}} = 20\pi \frac{\text{rad}}{\text{sec}}$



$\cos\theta = \frac{x}{10}$

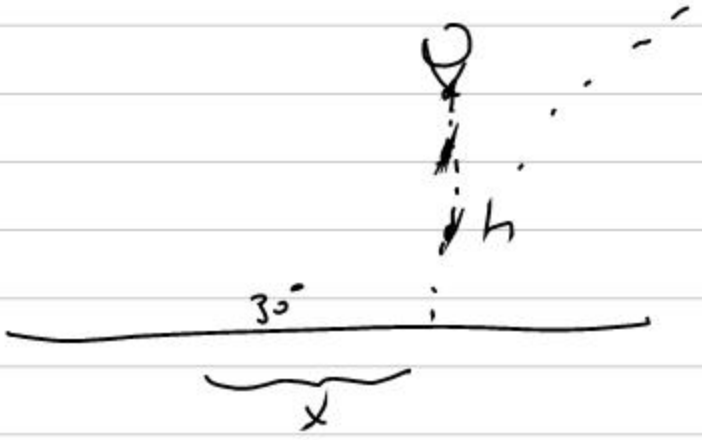
$-\sin\theta \frac{d\theta}{dt} = \frac{1}{10} \frac{dx}{dt}$

$\frac{dx}{dt} = -200\pi \sin\theta$

From Review

p. 160 #13

$h(t) = 60 - 4.9t^2$



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

$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3} = \frac{h}{x}$

$x = \sqrt{3}\,h$

$\frac{dx}{dt} = \sqrt{3}\,\frac{dh}{dt}$

$60 - 4.9t^2 = 35$

$25 = 4.9t^2$

$\frac{25}{4.9} = t^2$

$\frac{250}{49} = t^2$

$t = \frac{5\sqrt{10}}{7}$

$\frac{dh}{dt} = -9.8t$

$\frac{dh}{dt} = -9.8\left(\frac{5\sqrt{10}}{7}\right)$

$\frac{dx}{dt} = \sqrt{3}\left(\frac{-14}{-9.8}\right)\frac{5\sqrt{10}}{7}$

$\frac{dx}{dt} = -7\sqrt{30}$

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39) $x = t^2 - 3t + 2$

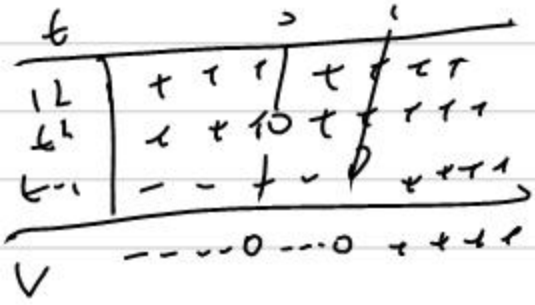
$v = 2t - 3$

$a = 2$

$$X(t) = 3t^4 - 4t^3$$

$$V(t) = 12t^3 - 12t^2$$

$$12t^2(t-1)$$



at rest at $t=0$, $t=1$

$x(0) = 0$

$x(1) = -1$

$$a(t) = 36t^2 - 24t$$

$$12t(3t-2)$$