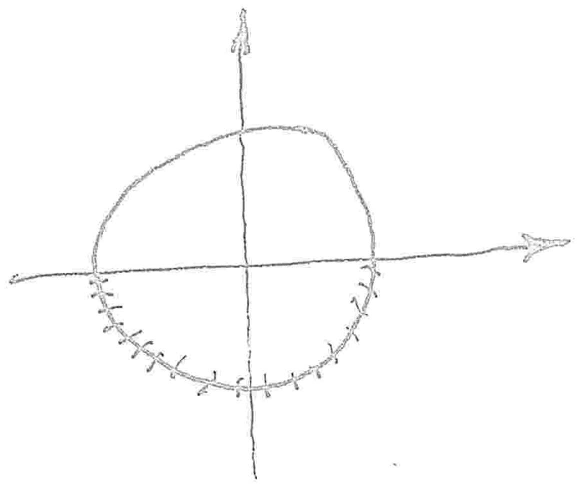
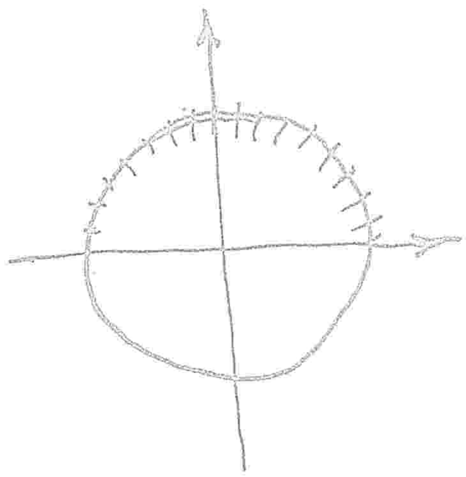
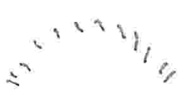
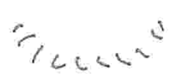
MAT 157: 20161102

RATE OF CHANGE PROBLEMS



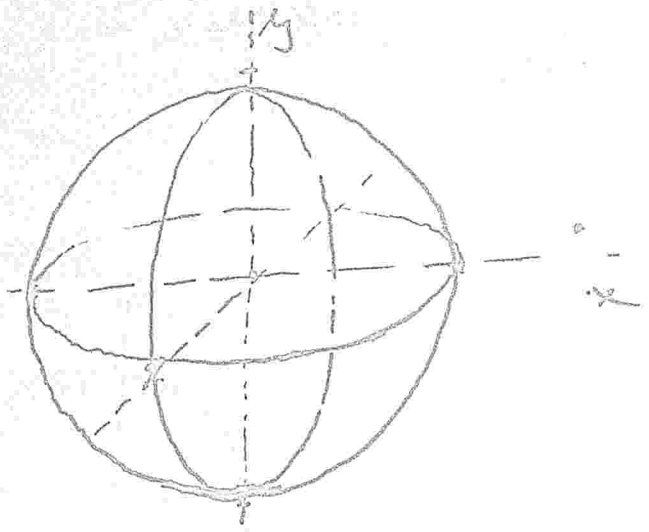


 : $y = \sqrt{1-x^2} \Rightarrow \frac{dy}{dx} = -\frac{x}{\sqrt{1-x^2}}$

 : $y = -\sqrt{1-x^2} \Rightarrow \frac{dy}{dx} = \frac{x}{\sqrt{1-x^2}}$

$x^2+y^2=1 \Rightarrow 2x + 2y\frac{dy}{dx} = 0$ $\Rightarrow \frac{dy}{dx} = \frac{-2x}{2y} = -\frac{x}{y}$	IMPLICIT DIFFERENTIATION

1. ◦ INVOLVES x & y. ◦ 2. WORKS ON SEMICIRCLES,
◦ ASSUMES THAT y EXISTS



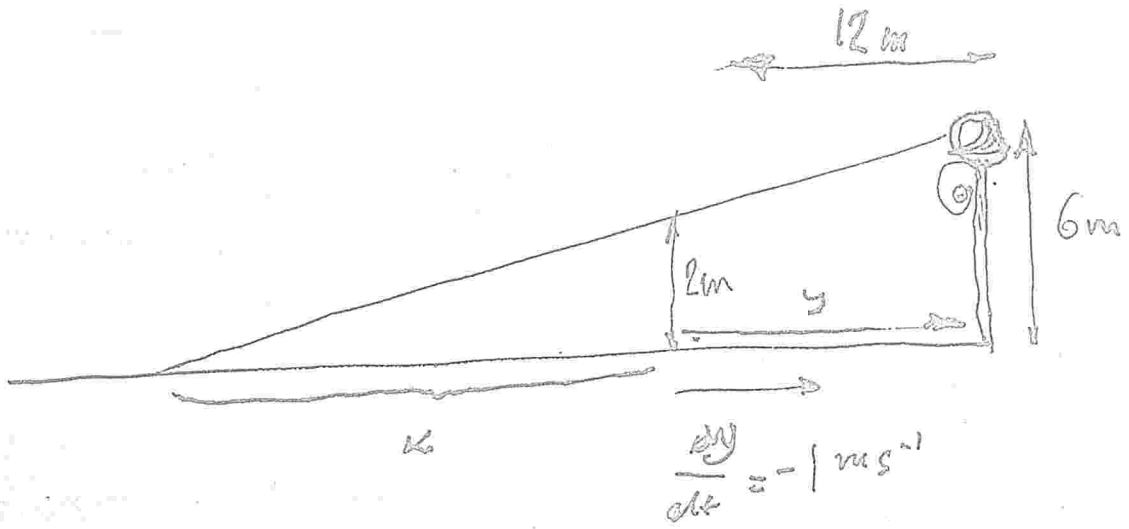
Suppose

$\frac{dV}{dt} = 10^{-3}\ m^3/min$

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

$V = \frac{4}{3}\pi r^3 \quad \therefore \quad \frac{dV}{dr} = \frac{4\pi}{3} \cdot 3r^2 = 4\pi r^2 = \frac{dV}{dr}$

$\therefore \quad \frac{dV}{dt} \cdot \frac{dr}{dV} = 4\pi r^2 \cdot \frac{dr}{dV} = 10^{-3}\ m^3/min$



$\frac{x}{x+12} = \frac{1}{3} \quad \therefore \quad x = 6\ m$

$y = 2x \quad \therefore \quad \frac{dy}{dx} = 2 \quad \therefore \quad \frac{dx}{dt} = -\frac{1}{2}\ ms^{-1}$

$\Rightarrow$ End of shadow approaches $1 + \frac{1}{2} = 3/2\ ms^{-1}$