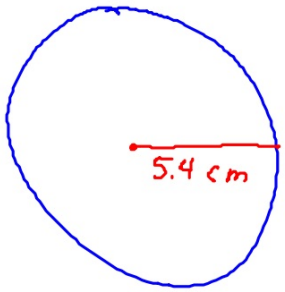
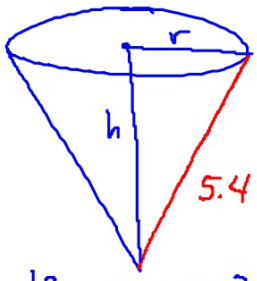
Optimization Problems

We will do the optimization activity on the handout.
You want to maximize the volume of the cone because I will fill your cone to capacity with some wonderful objects.





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

$V(h) = \frac{\pi}{3}(29.16 - h^2)h$

$V(h) = \frac{29.16\pi}{3}h - \frac{\pi}{3}h^3$

$V'(h) = \frac{29.16\pi}{3} - \pi h^2 = 0$ or $V'(h)$ dne never

$h^2 + r^2 = 5.4^2$

$r^2 = 29.16 - h^2$

$r^2 = 29.16 - 3.118^2$

$r = \pm\sqrt{29.16 - 3.118^2}$

$r \approx 4.409$

$\frac{29.16\pi}{3} = \pi h^2$

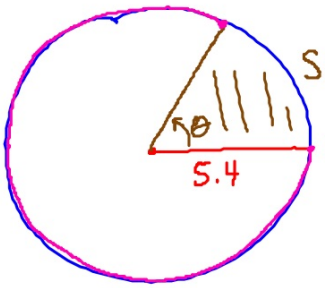
$h^2 = \frac{29.16}{3}$

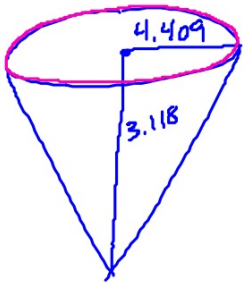
$h = \pm\sqrt{\frac{29.16}{3}}$

$h \approx \pm 3.118$

	−		+		−	
		−3.118		3.118		$V'(h)$
			inc		dec	$V(h)$
				max.		

The cone of max. volume has a radius of 4.409 cm and a height of 3.118 cm.





$C = 2\pi r$

$C = 2\pi(4.409)$

$C \approx 27.703$

$C = 2\pi R$

$C = 2\pi(5.4)$

$C = 10.8\pi$

$S = 10.8\pi - 27.703$

$S \approx 6.226$

$S = r\theta$

$6.226 = 5.4\theta$

$\theta \approx 1.153 \text{ radians} \cdot \frac{180^\circ}{\pi} \approx 66.061^\circ$

Units!!!

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

$V = \frac{\pi}{3}(4.409)^2(3.118) \approx 63.468 \text{ cm}^3$