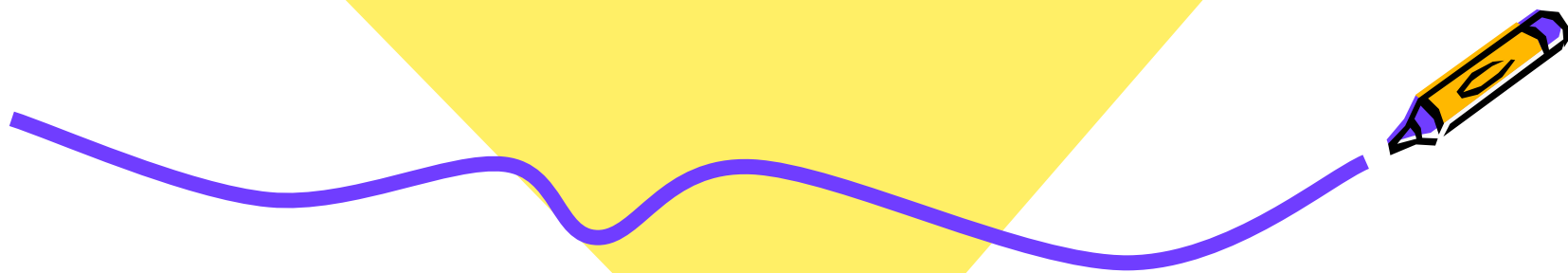


Calculus BC

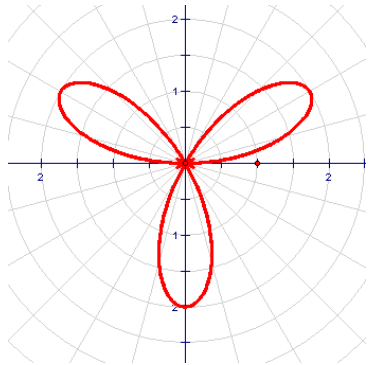
Unit 1 Day 4



Arrival Instructions

- Take out your HW



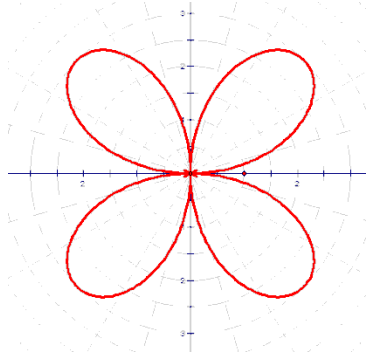
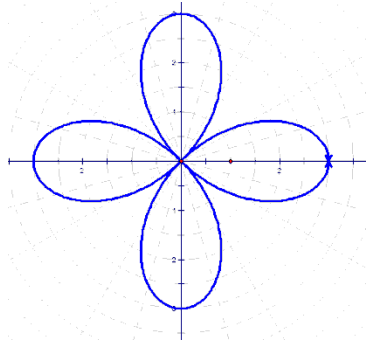


Rose Curves:

$$r = a \sin(n\theta) \quad r = a \cos(n\theta)$$

~Pick cosine if a leaf is split by the x-axis

~ a : length of petal from the pole
(maximum r for the function)



n	# petals	Domain (Period)
Even	$2n$	$[0, 2\pi]$
Odd	n	$[0, \pi]$

Packet pg. 4, #1



Equation: There is a leaf split by the x-axis and odd number of leaves:
leaves: $r(\theta) \cong a \cos 3\theta$

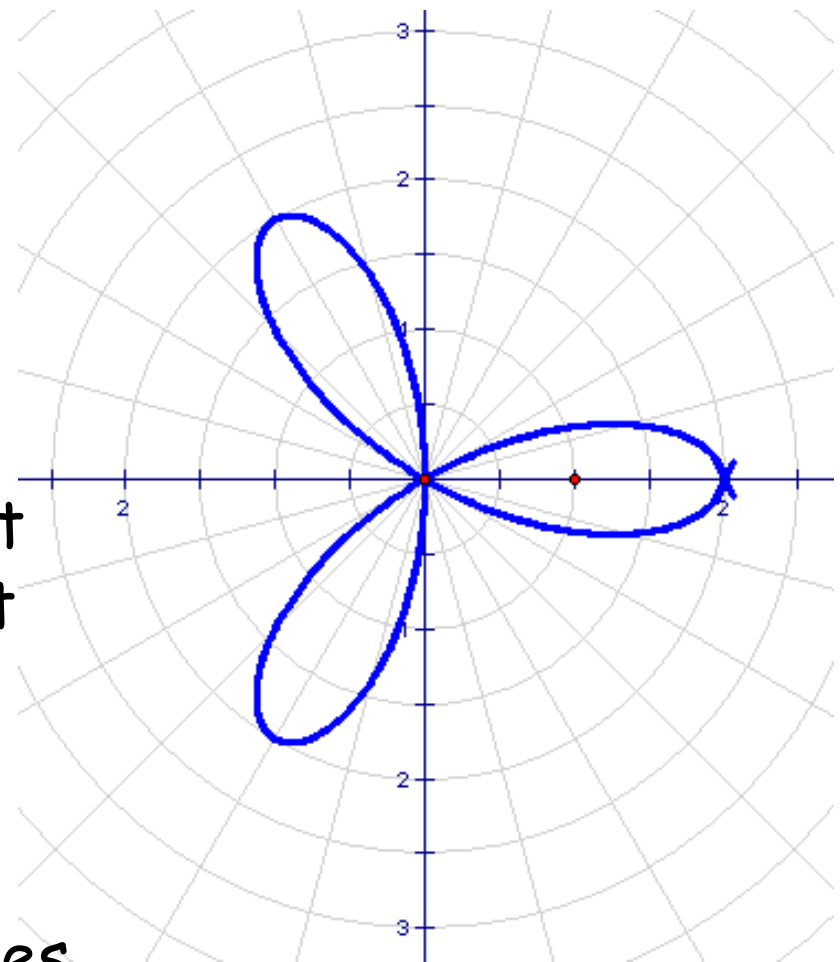
Length of leaf is 2:

$$r(\theta) \cong 2 \cos 3\theta$$

Domain (θ values required to generate entire curve without plotting back over points that are already plotted):

$$[0, \pi]$$

Because ODD
number of leaves



Packet pg. 4, #5



Equation: There is a leaf split by the x-axis and even number of leaves:

$$r(\theta) \cong \text{acos}\left(\frac{4}{2}\theta\right) = \text{acos}(2\theta)$$

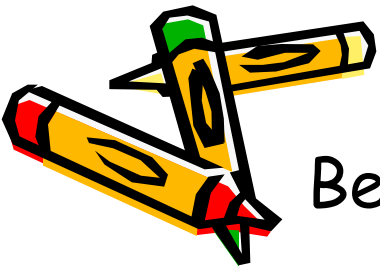
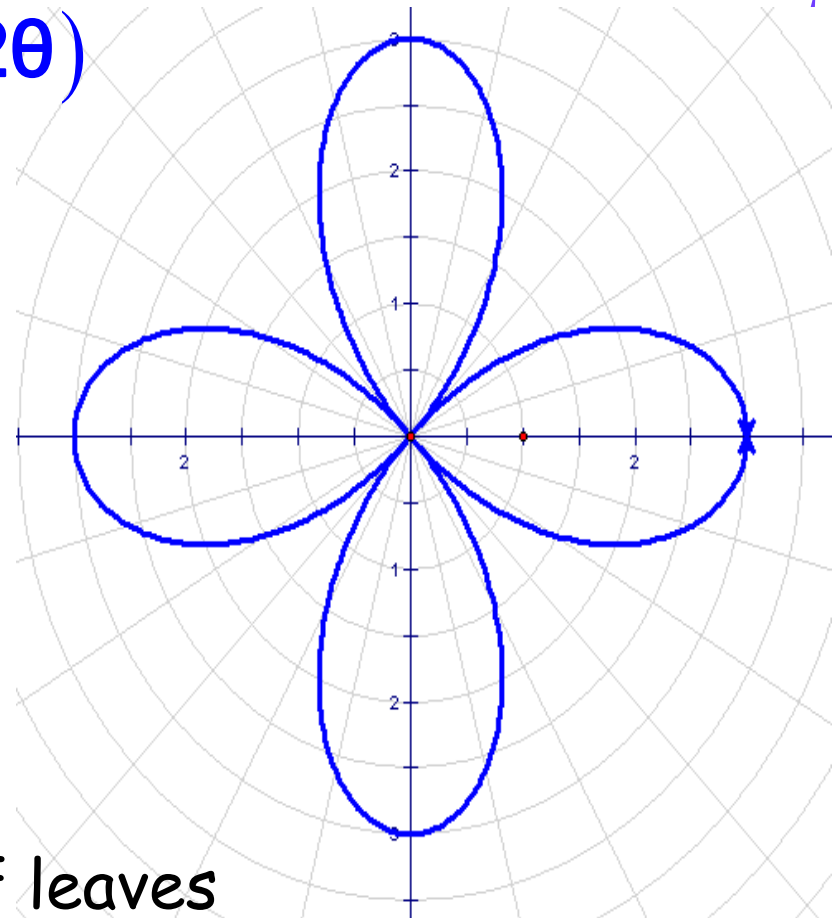
Length of leaf is 3:

$$r(\theta) \cong 3\text{cos}(2\theta)$$

Domain (θ values required to generate entire curve without plotting back over points that are already plotted):

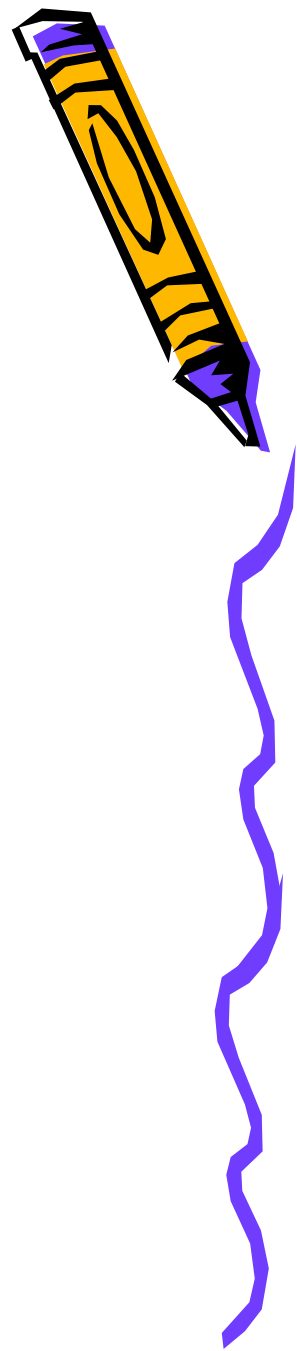
$$[0, 2\pi]$$

Because EVEN number of leaves



You Try . . .

- Write the equation for pg. 4 #3



Summary...

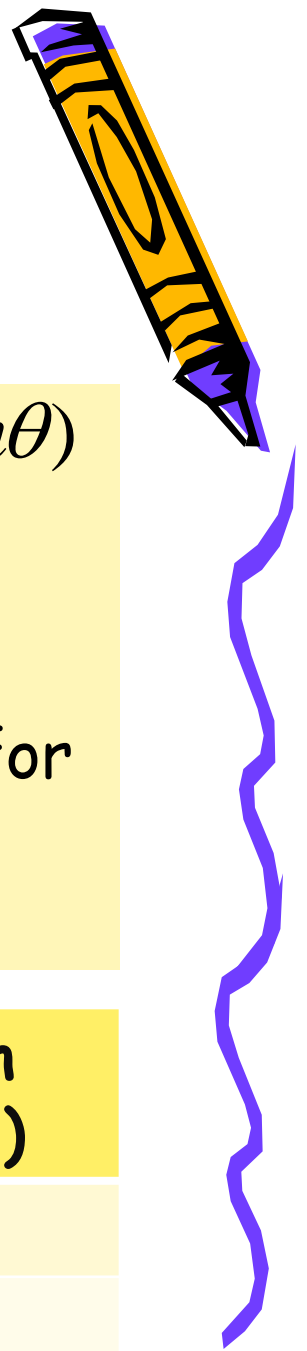
Write the equation for **pg. 4 #3**

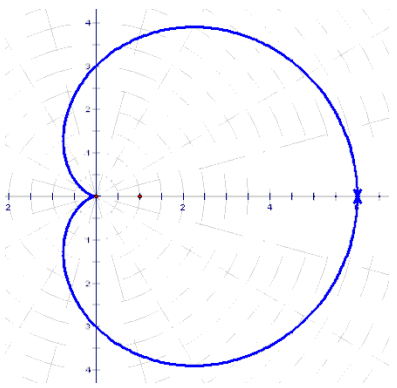
Recall Rose Curves: $r = a \sin(n\theta)$ $r = a \cos(n\theta)$

~Pick cosine if a leaf is split by the x-axis

~ a : length of petal from the pole (maximum r for the function)

n	# petals	Domain (Period)
Even	$2n$	$[0, 2\pi]$
Odd	n	$[0, \pi]$





Limaçon Curves:

$$r = a \pm b \sin(\theta) \quad r = a \pm b \cos(\theta)$$

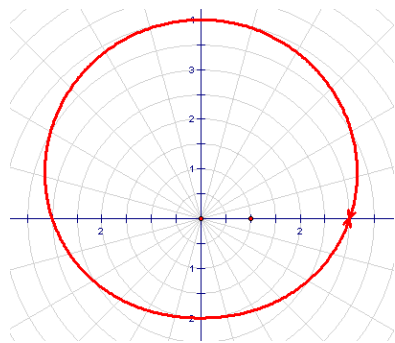
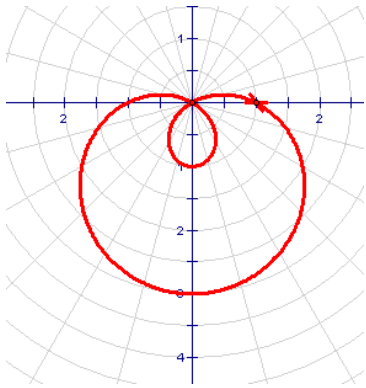
y-axis symmetry—pick sine

x-axis symmetry—pick cosine

\pm indicates the orientation on the axis

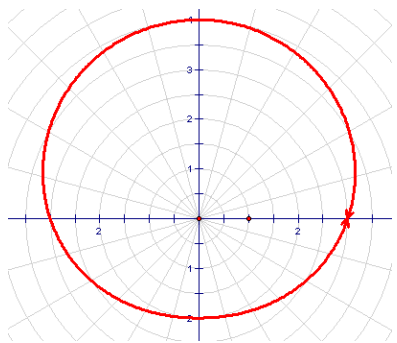
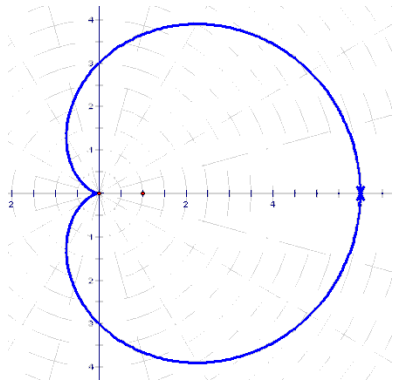
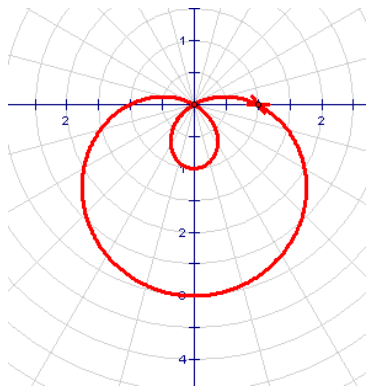
+ the orientation is on the positive axis

- the orientation is on the negative axis



Type of Limaçon depends on the value of $\frac{a}{b}$





$\frac{a}{b}$	Type of Limaçon Curve
$\frac{a}{b} < 1$ (which means $a < b$)	Inner Loop
$\frac{a}{b} = 1$ (which means $a = b$)	Cardioid
$1 < \frac{a}{b} < 2$ (which means $b < a < 2b$)	Dimpled
$2 \leq \frac{a}{b}$ (which means $2b \leq a$)	Convex

Domain for all types is $[0, 2\pi]$.
 Writing equations:

Calculate $\frac{\max + \min}{2}$ and $\frac{\max - \min}{2}$

Packet pg. 5, #9



Equation:

Positive x-axis orientation.

Pick $r = a + b\cos(\theta)$

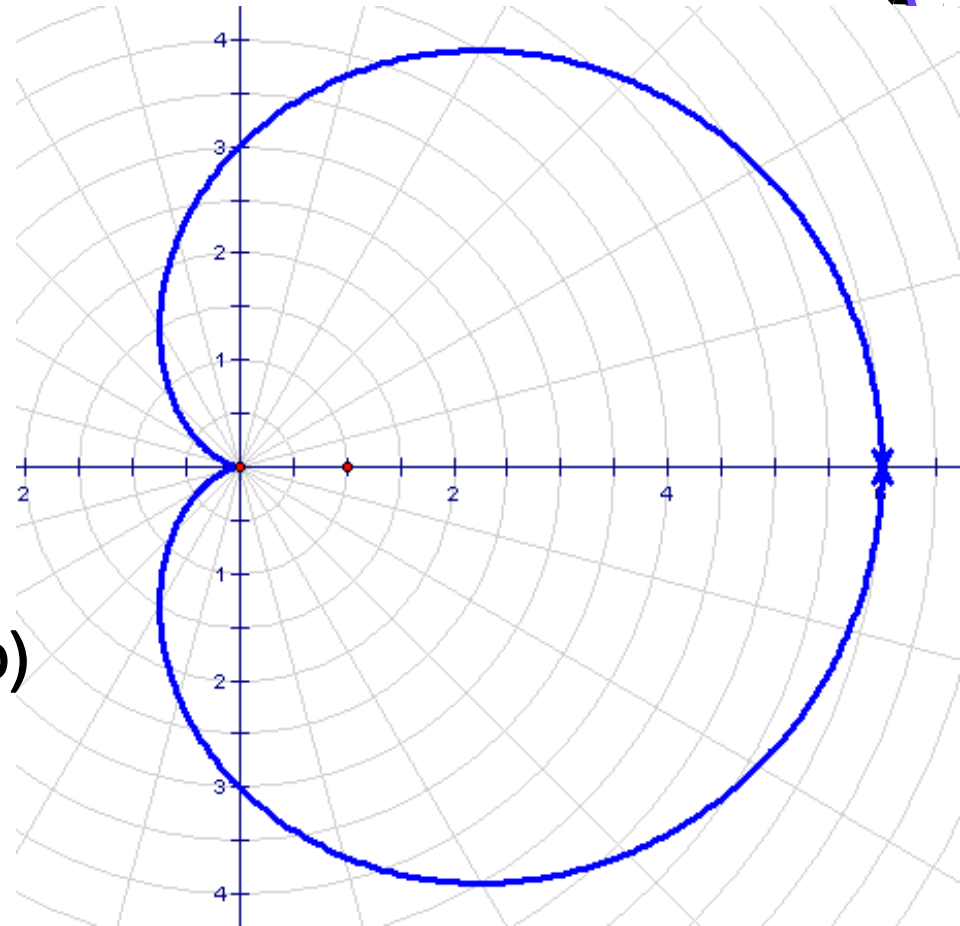
Calculate

$$\frac{\max + \min}{2} \text{ and } \frac{\max - \min}{2}$$

Place the values to get
a cardioid

$$\frac{a}{b} = 1 \text{ (which means } a = b \text{)}$$

$$r = 3 + 3\cos(\theta)$$



Packet pg. 6, #11



Equation:

Negative y-axis orientation.

Pick $r = a - b\sin(\theta)$

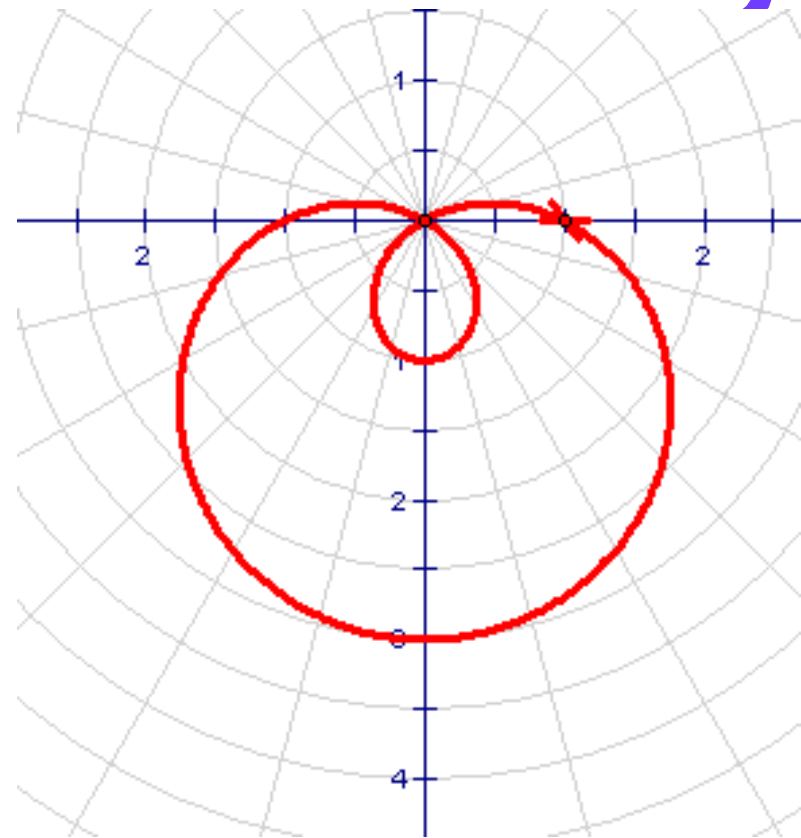
Calculate

$$\frac{\max + \min}{2} \text{ and } \frac{\max - \min}{2}$$

Place the values to get an inner loop

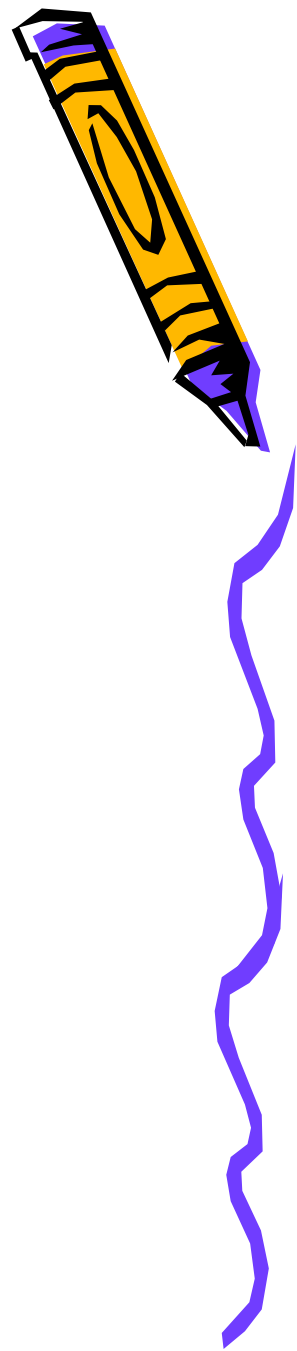
$$\frac{a}{b} < 1 \text{ (which means } a < b \text{)}$$

$$r = 1 - 2\sin(\theta)$$

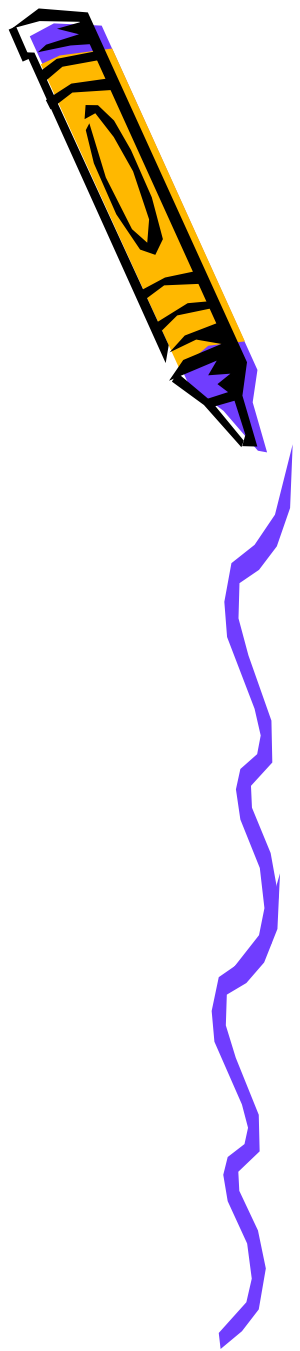


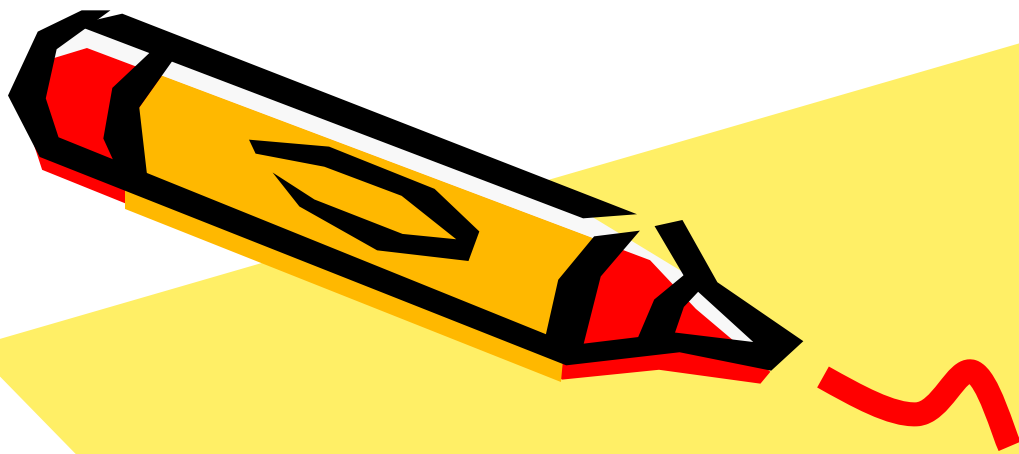
You Try . . .

- Write the equation for pg. 5 #15



HW Questions?





Calculus BC

NEW Topic
Arc Length



Self-Study

- Arc Length Handout

