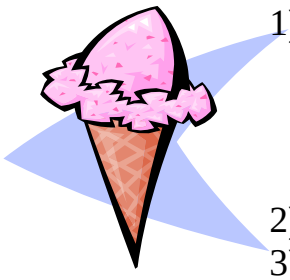
Screaming for Ice Cream

Maximize the volume of a cone . . . for obvious reasons . . .

PROJECT DEADLINE:_____

LAB INSTRUCTIONS: (For steps 1 through 11)

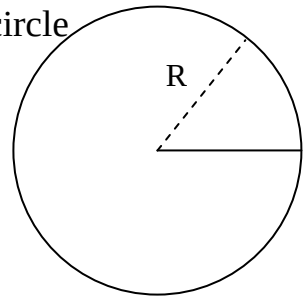


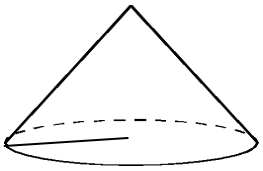
1) Draw a circle of Radius 5 cm and cut it out with scissors. Use Geometry to find the center of the circle.
   Explain the geometry you applied.

2) Draw a radius, R, and cut along one radius of the circle.
3) Construct a cone by pulling the circle into a cone shape.
4) Select the cone that seems to have the greatest volume, mark the central angle, θ. Measure Radius in cm and angle θ in degrees.
   R = radius of original circle

R = _____

θ = _____





r = radius of cone

5) Find the degree measure of the remaining sector. _____

6) Find the volume of your cone. V = _____
   Remember V = $\frac{1}{3}\pi r^2 h$

7) Compare your volume to others in the class, using different values of θ.

θ																
V(θ)																

8) Estimate the maximum volume for the cone **based on the numerical data shown above**.

9) Write a function V(h) for the volume of your paper cone.

10) Now, write a function V(θ) for the volume of your paper cone.

10) Find the maximum volume **graphically** *using your preference of V(h) or V(θ).*
11) Find the maximum volume **using calculus**.
12) Now, solve for the maximum volume of any given cone formed from a circle of radius 1. Use θ and h as variables and then apply calculus to maximize V(θ) or V(h). State the maximum volume and the values of h and θ that will give that maximum.

Scoring Rubric for Ice Cream Project

Category	Average	Great	Superior	SCORE
Lab Completion Steps 1-12	Completed steps 1-12 with teacher assistance. ***(6 points)***	Completed steps 1-12 with minimal teacher assistance. ***(8 points)***	Completed steps 1-8 with no teacher assistance, steps 9-12 with little or no assistance. ***(12 points)***	
Symbolic Model	Volume expressed in two variables, r and h. ***(16 points)***	Volume expressed in terms of r and h; Diagram supplied to explain the model ***(18 points)***	Volume expressed in two variables, r and h; Both V(h) and V(θ) found from V(r). Diagram supplied to explain each model. ***(22 points)***	
Graphic Model	Graph of the V(h) supplied. (Use graph paper or capture calculator screen image.) ***(16 points)***	Graphs of V(h) and V(θ) supplied, complete with title, labels, and maximum volume indicated. ***(18 points)***	Graphs of V(h) and V(θ) supplied, complete with title, labels, and maximum volume indicated. Domain restrictions indicated. ***(20 points)***	
Calculus Solution	Calculus integration or differentiation used to find maximize volume. ***(22 points)***	Calculus integration or differentiation steps shown to maximize volume. Comparison of the maximum volume found using graphical method and the maximum volume found using calculus ***(26 points)***	Calculus integration or differentiation steps shown to maximize volume. Comparison of the maximum volume found using graphical method and the maximum volume found using calculus; Explanation of which method is more accurate and why. ***(30 points)***	
Conclusion	Summary of how to maximize the volume of a cone, given radius of the circle from which the cone is cut. Conclusions about the changes in the formula depending upon the value of R, radius of the circle. Calculate the maximum volume of the ice cream in cones eaten in class on ice cream day. Speculative uses of the maximization of cones in real world applications other than ice cream cones. ***(16 points)***			
			TOTAL SCORE	

Remember to include this scoring rubric as the last page of your report.