

Max circumference
= 20.5 cm

$$C = \pi d$$

$$20.5 = \pi d$$

$$d = \frac{20.5}{\pi} \quad \text{max diameter}$$

center hole $d = .45$ cm
recessed top depth = .5 cm

height	circumference	diameter
1 cm	14.7 cm	$\frac{14.7}{\pi}$ cm
2 cm	17 cm	$\frac{17}{\pi}$ cm
3 cm	19.25 cm	$\frac{19.25}{\pi}$ cm
4 cm	20 cm	$\frac{20}{\pi}$ cm
5 cm	18.5 cm	$\frac{18.5}{\pi}$ cm

Washer method = $\int_a^b \pi (\text{outer radius}^2 - \text{inner radius}^2) dx$

outer radius = $\frac{d}{2}$ inner radius = .225 cm²

excel trend line equation up to 5 cm
 $y = -.1273x^2 + .9468x + 1.3977$

$$V' = \pi \int_0^5 (-.1273x^2 + .9468x + 1.3977)^2 - (.225)^2 dx$$

$$V' = \pi \int_0^5 (.01620529x^4 - .24105528x^3 + .54057582x^2 + 2.64668472x + 1.90294029) dx$$

$$V = \pi \left[.01620529 \left(\frac{x^5}{5} \right) - .24105528 \left(\frac{x^4}{4} \right) + .54057582 \left(\frac{x^3}{3} \right) + 2.64668472 \left(\frac{x^2}{2} \right) + 9.51470145 \right]$$

$$V' = \pi (37.58566)$$

$$V' = 118.07885 \text{ cm}^3$$

Since the top of the apple is a dome from 5 cm to 5.5 cm, I split the top of the apple down the (1.75, 5.5) point and calculated the (right + line) - (left + line) equations for outer minus inner radius. Due to this I had to take 4 extra measurements for circumference to get a curve

<u>Height</u>	<u>Circumference</u>	<u>Diameter</u>
5.25 cm up	16.65 cm	$\frac{16.65}{\pi}$
5.25 cm down	4.7 cm	$\frac{4.7}{\pi}$
5.45 cm up	14.14 cm	$\frac{14.14}{\pi}$
5.45 cm down	8.8 cm	$\frac{8.8}{\pi}$

Right side curve equation

$$y = -.4649x^2 + 1.7652x + 3.8341$$

left side curve equation

$$y = -.1522x^2 + .06292x + 4.8657$$

$$V^2 = \pi \int_5^{5.5} \left((-.4649x^2 + 1.765x + 3.8341)^2 - (-.1522x^2 + .06292x + 4.8657)^2 \right) dx$$

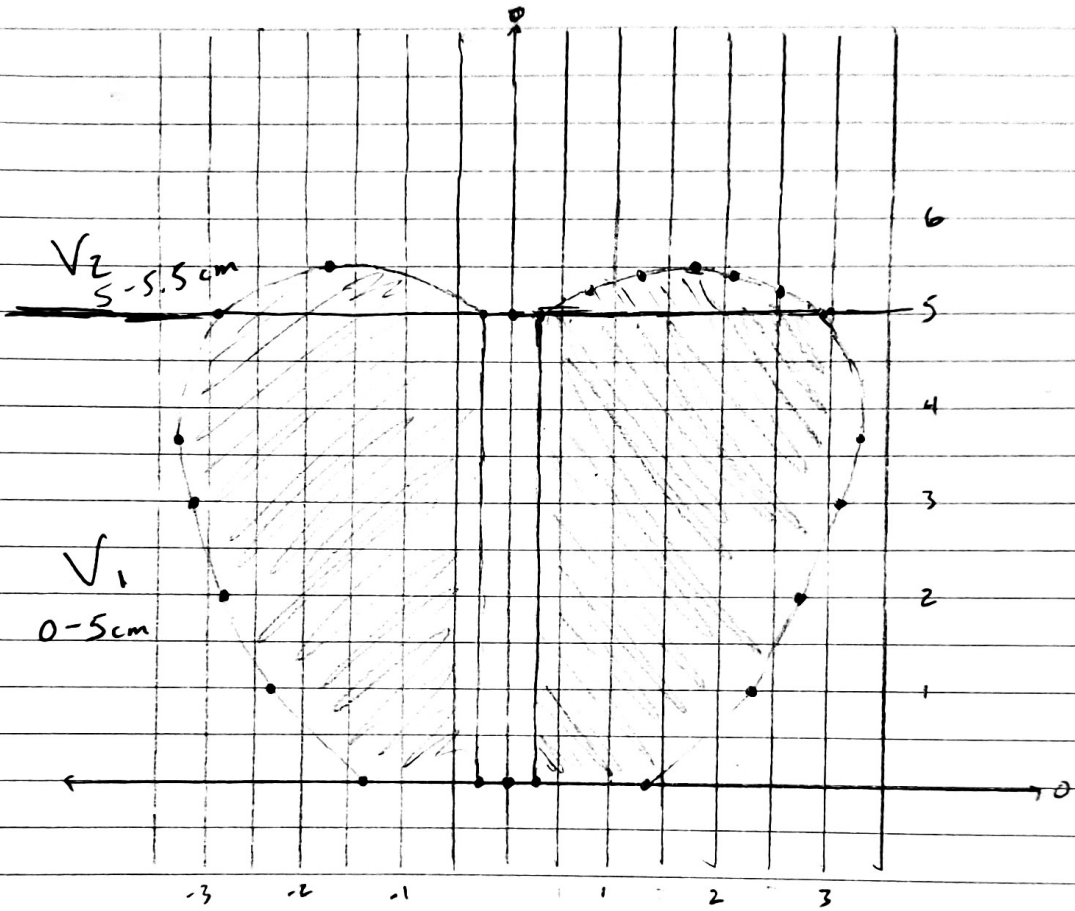
$$V^2 = \left| \pi (-.38286) \right|$$

$$V^2 = 1.20281$$

$$V_t = v_1 + v_2$$

$$V_t = 118.07895 + 1.20281$$

$$V_t = 119.99131$$



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Chart Design ribbon: Chart Styles, Chart Layouts, Switch Row/Column, Select Data, Change Chart Type, Move Chart

Chart 9 : fx

1	0	1.35
2	1	2.339577663
3	2	2.705634033
4	3	3.063732655
5	4	3.183098862
6	5	2.944366447
7	5.5	1.75
8	5	0.225
9		
10		
11	0.225	5
12	0.748028	5.25
13	1.400563	5.45
14	1.75	5.5
15		
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21	1.75	5.5
22	2.250451	5.45
23	2.64993	5.25
24	2.944366	5
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