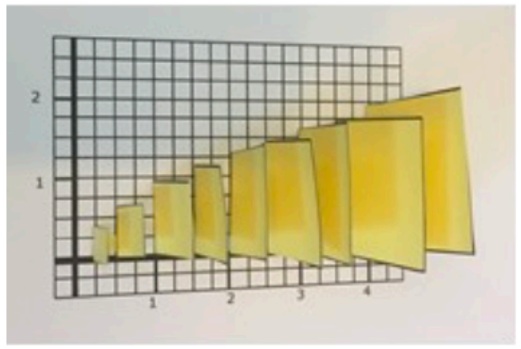
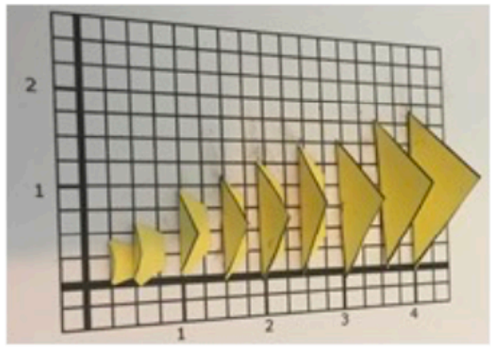
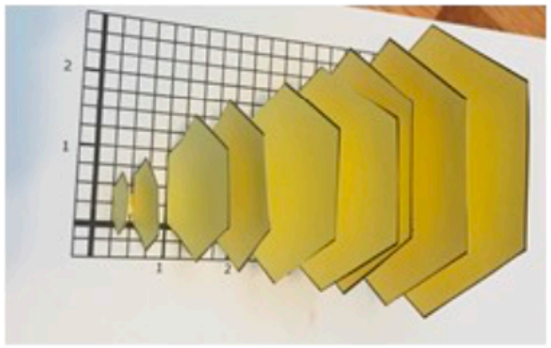
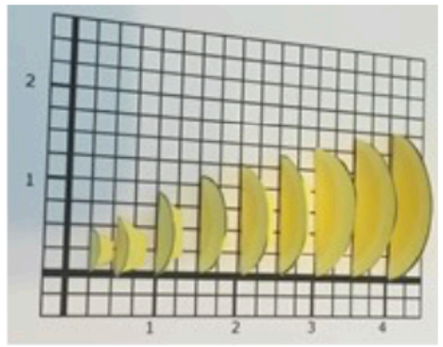
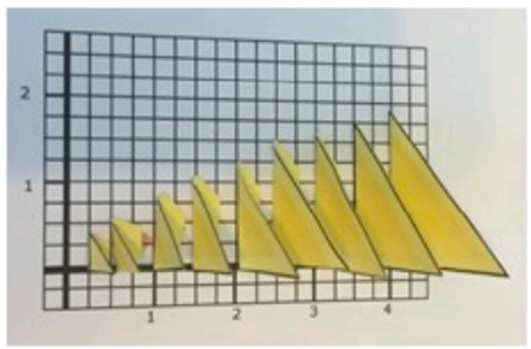
Solids of Known Cross Sections

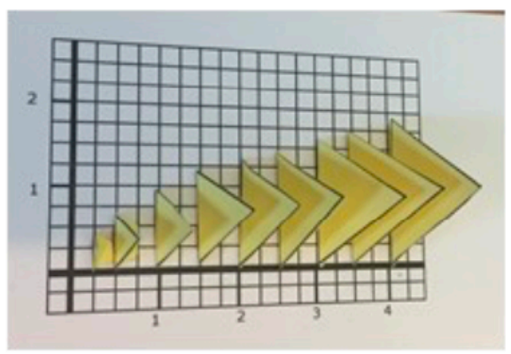


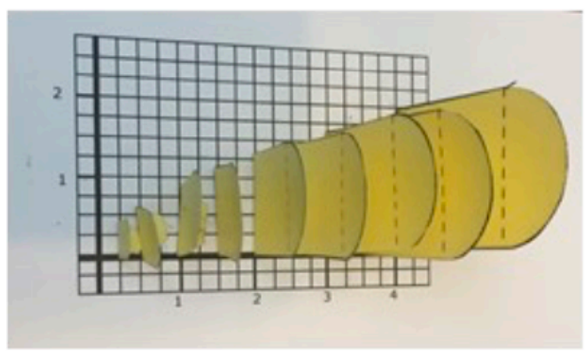


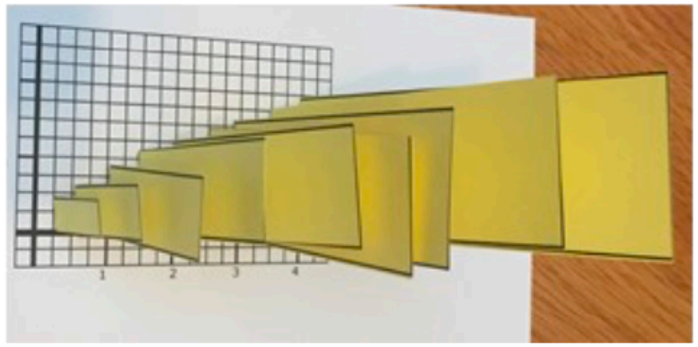






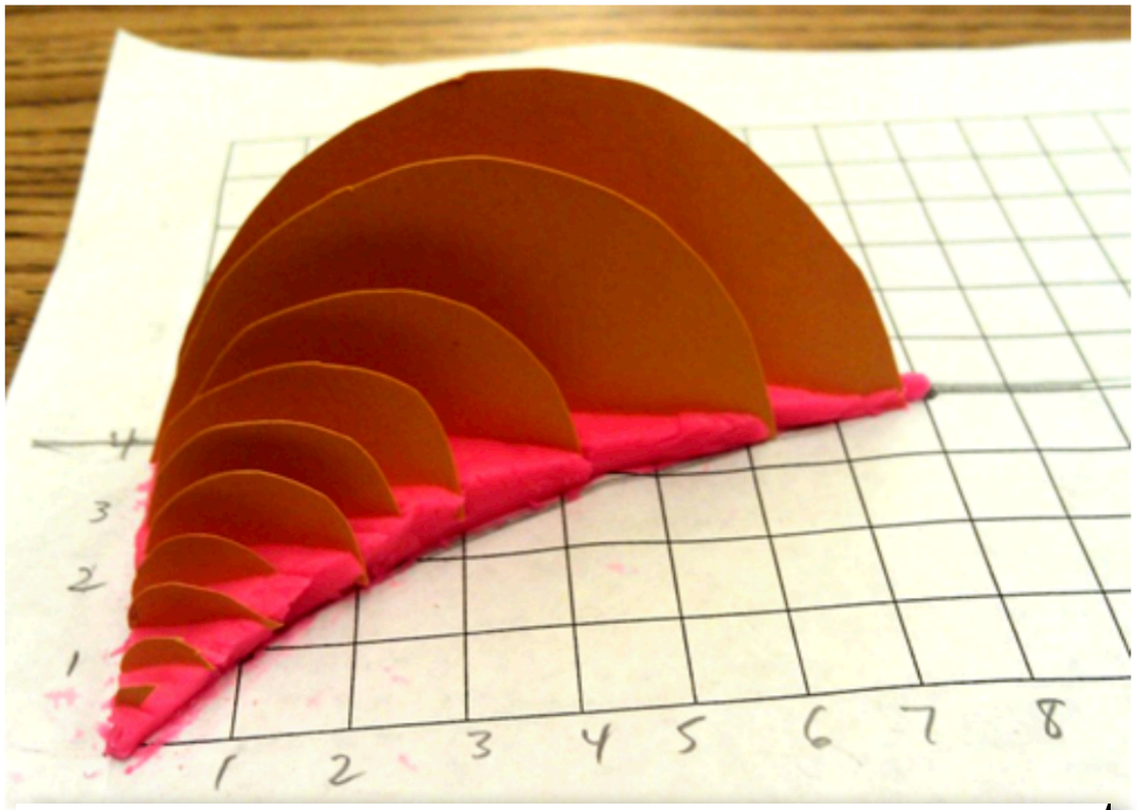






3D PROJECT

EXAMPLES

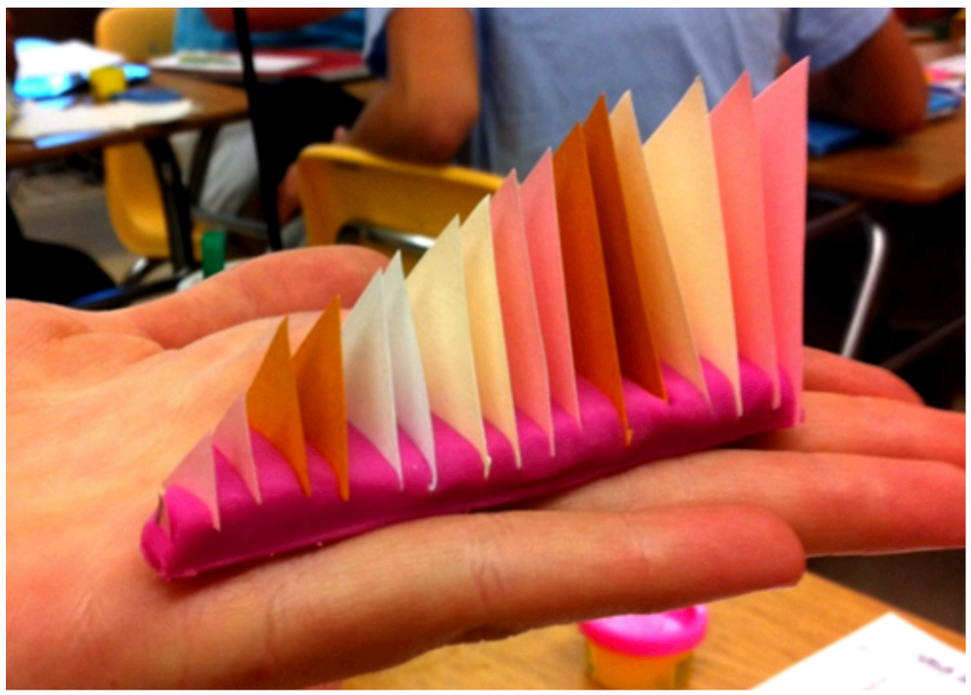


R, the base of the solid, is the region bounded by the graphs of…

$y = x^{2/3}$, $x = 0$, and $y = 4$

Cross-sections perpendicular to the *y*-axis are semicircles with their diameter in *R*

Create your solid using Play-Doh and paper. Calculate its volume (Calculator okay).



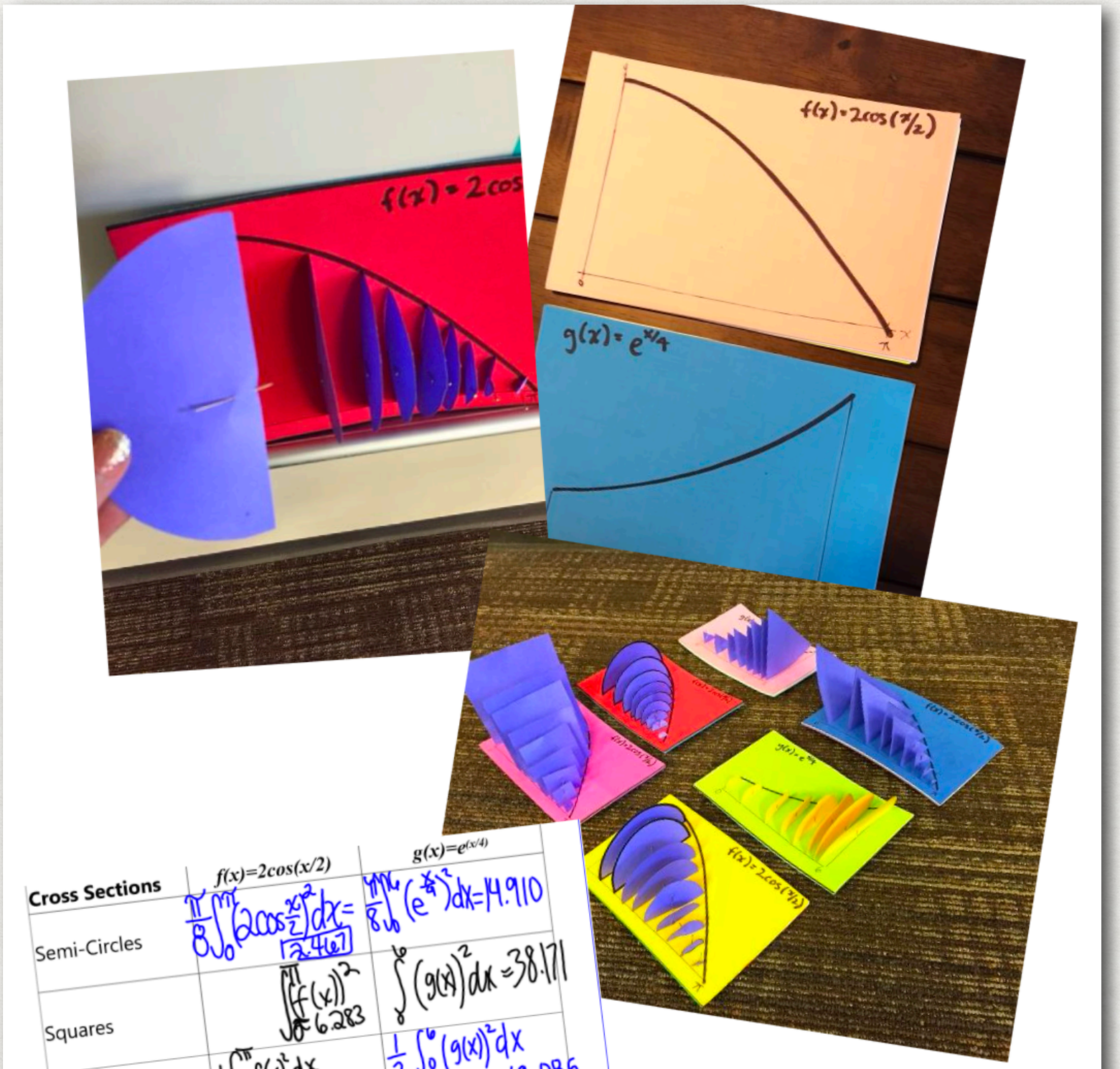
March 2012

R, the base of the solid, is the region bounded by the graphs of…

$y = x^{2/3}$, $y = 0$, and $x = 8$

Cross-sections perpendicular to the *x*-axis are equilateral triangles with their base in *R*

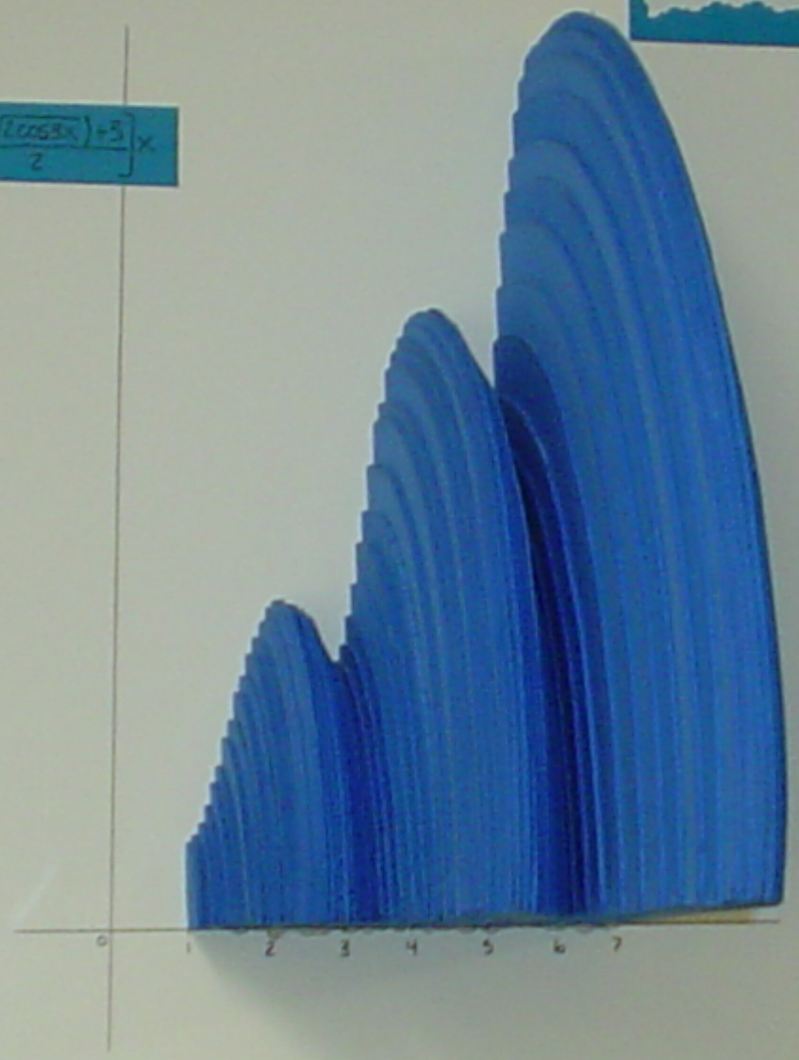
Create your solid using Play-Doh and paper. Calculate its volume (Calculator okay).



Cross Sections	$f(x)=2\cos(x/2)$	$g(x)=e^{(x/4)}$
Semi-Circles	$\frac{\pi}{8}\int_0^{\pi}\left(2\cos\frac{x}{2}\right)^2 dx = 2.467$	$\frac{\pi}{8}\int_0^6 \left(e^{\frac{x}{4}}\right)^2 dx = 14.910$
Squares	$\int_0^{\pi}(f(x))^2 = 6.283$	$\int_0^6 (g(x))^2 dx = 38.171$
Rectangles (height=1/2 base)	$\frac{1}{2}\int_0^{\pi} f(x)^2 dx = \pi$	$\frac{1}{2}\int_0^6 (g(x))^2 dx \approx 19.085$
Isosceles Right	$\frac{1}{4}\int_0^{\pi}(f(x))^2 dx = 1.5708$	$\frac{1}{2}\int_0^6 \left(e^{x/4}\right)^2 dx = 19.1$

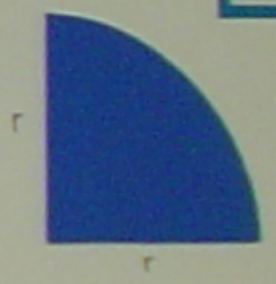
THE WAE

Equation: $\left[\frac{2(\sqrt{2}\cos 3x)+3}{2}\right]x$



Total Volume = 138.374

Area = $\frac{1}{4}\pi r^2$



Definate Integral $= .25\pi\int_{0}^{7}\left[\left(\frac{2(\sqrt{2}\cos 3x)+3}{2}\right)x\right]^2 dx = 91.173$

Emily Anderson
P. 2

Volume by spreadsheets: 222.181

Volume by integral: 221.976

$2\sin(2x-\frac{\pi}{2})+2$

$\theta = 120°$

$s = s$

$A = \frac{3\sqrt{3}}{2}s^2$

$V = \frac{3\sqrt{3}}{2}(2\frac{1}{2})^2 \cdot 5$

x-coordinate

length of sides $(y_2 - y_1)dx$

area of slice (2d)

volume of slice (3d)

y_1 coordinate

y_2 coordinate

Functions Used:

$y_1 = \cos(\tan(.5x))$

$y_2 = (.35x)^4 - 4$

Yoda

Shapes:

Ears

Equalateral Triangles

Face

Theoretical Volume:

Left Ear: $\frac{\sqrt{3}}{4}\int_{-3.760}^{-3.15}(Y_1-Y_2)^2\,dx + \frac{\sqrt{3}}{4}\int_{-3.13}^{-2.525}(Y_1-Y_2)^2\,dx$

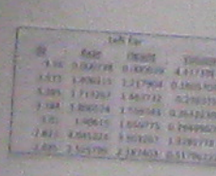
Right Ear: $\frac{\sqrt{3}}{4}\int_{2.525}^{3.14}(Y_1-Y_2)^2\,dx + \frac{\sqrt{3}}{4}\int_{3.15}^{3.760}(Y_1-Y_2)^2\,dx$

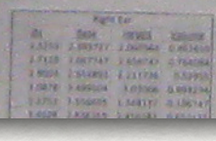
Face: $\frac{\pi}{4}\int_{-2.525}^{2.525}(Y_1-Y_2)^2\,dx$

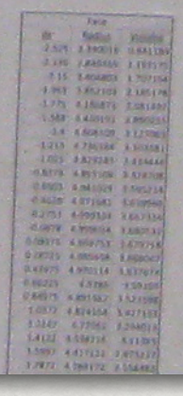
+

Theoretical Volume: $84.847\ in^3$

"Learn the derivative of Calculus, you must."







Total Volume: $83.423 in^3$

...hat know

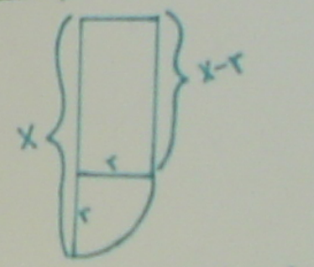
Spring...

Functions:

$y = \frac{1}{8}x^4 - 9$

$y = \frac{1}{2}\cos x$

Shape of X-section:



r = 3.5 - (x-coordinate)

X-Coordinates	Lengths	Width	Slice Area	Slice Vol
-3	.7031	.5	.4052	.06331
-2.844	1.0104	.65625	.57067	.08917
-2.688	1.3576	.8125	1.7739	.27717
-2.531	1.4861	.96875	3.1757	.49621
-2.375	4.5243	1.125	4.8183	.75283
-2.219	5.5444	1.2813	6.7514	1.0549
-2.063	6.5452	1.4375	8.9652	1.4008
-1.906	7.4629	1.5938	11.349	1.7733
-1.75	8.2046	1.75	13.701	2.1408
-1.594	8.6914	1.9063	15.788	2.4669
-1.438	8.8968	2.0625	17.437	2.7245
-1.281	8.8636	2.2188	18.610	2.9078
-1.125	8.6944	2.375	19.439	3.0373
-.9688	8.5185	2.5313	20.187	3.1543
-.8125	8.4485	2.6875	21.155	3.3055
-.6563	8.5421	2.8438	22.556	3.5244
-.5	8.7841	3	24.421	3.8158
-.3438	9.0955	3.1563	26.570	4.1515
-.1875	9.3657	3.3125	28.669	4.4795
-.0313	9.4961	3.4688	30.357	4.7434
.125	9.4388	3.375	29.433	4.5955
.28125	9.2148	3.2188	27.437	4.2870
.4375	8.9063	3.0625	25.263	3.9473
.59375	8.6243	2.9063	23.252	3.6331
.75	8.4655	2.75	21.657	3.3839
.90625	8.473	2.5938	20.533	3.2083

... into math!

Total Volume: 89.775


THE MAGIC IS IN THE MATH!
-3.671
3.671
-4
4