

# Project

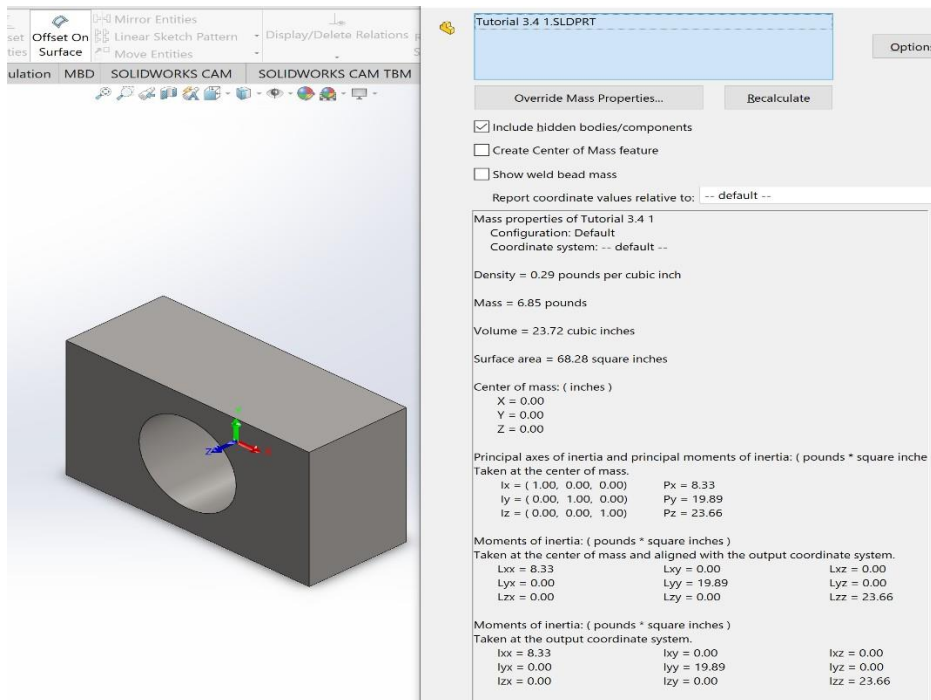
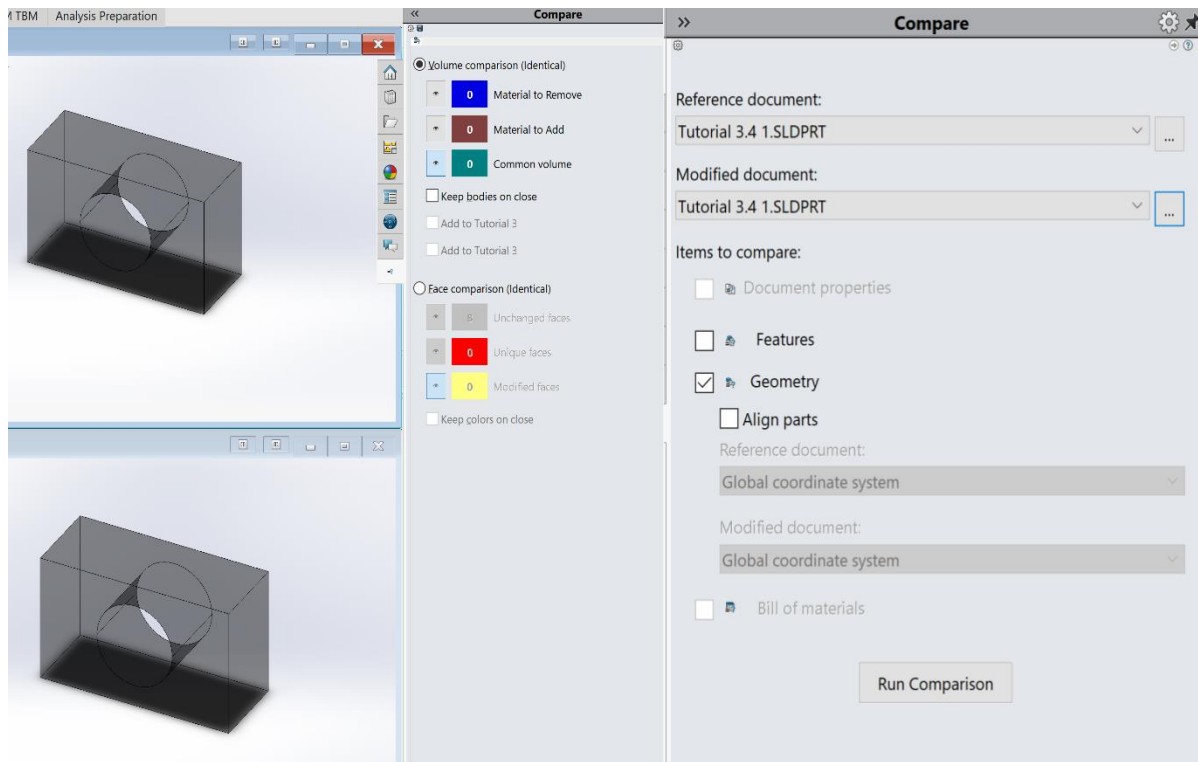
## IGES file

```
Tutorial 3.4 1 - Notepad
File Edit Format View Help
SolidWorks IGES file using analytic representation for surfaces S 1
1H,,1H;14HTutorial 3.4 1,55HC:\Users\16177\Documents\CAD\week6\1\TutoriG 1
al 3.4 1.IGS,15HSolidWorks 2020,15HSolidWorks 2020,32,308,15,308,15,14HTG 2
utorial 3.4 1,1.,1,2HIN,50,0.125,13H210227.140040,1E-08, G 3
19684.6456692913,5H16177,,11,0,13H210227.140040; G 4
314 1 0 0 0 00000200D 1
314 0 8 1 0 0D 2
110 2 0 0 0 01010000D 3
110 0 0 1 0 0D 4
110 3 0 0 0 01010000D 5
110 0 0 1 0 0D 6
120 4 0 0 0 01010000D 7
120 0 0 1 0 0D 8
126 5 0 0 0 01010500D 9
126 0 0 2 0 0D 10
110 7 0 0 0 01010000D 11
110 0 0 1 0 0D 12
126 8 0 0 0 01010500D 13
126 0 0 2 0 0D 14
100 10 0 0 0 01010000D 15
100 0 0 1 0 0D 16
126 11 0 0 0 01010500D 17
126 0 0 2 0 0D 18
110 13 0 0 0 01010000D 19
110 0 0 1 0 0D 20
126 14 0 0 0 01010500D 21
126 0 0 2 0 0D 22
124 16 0 0 0 00000000D 23
124 0 0 4 0 0D 24
100 20 0 0 0 23 01010000D 25
100 0 0 1 0 0D 26
```

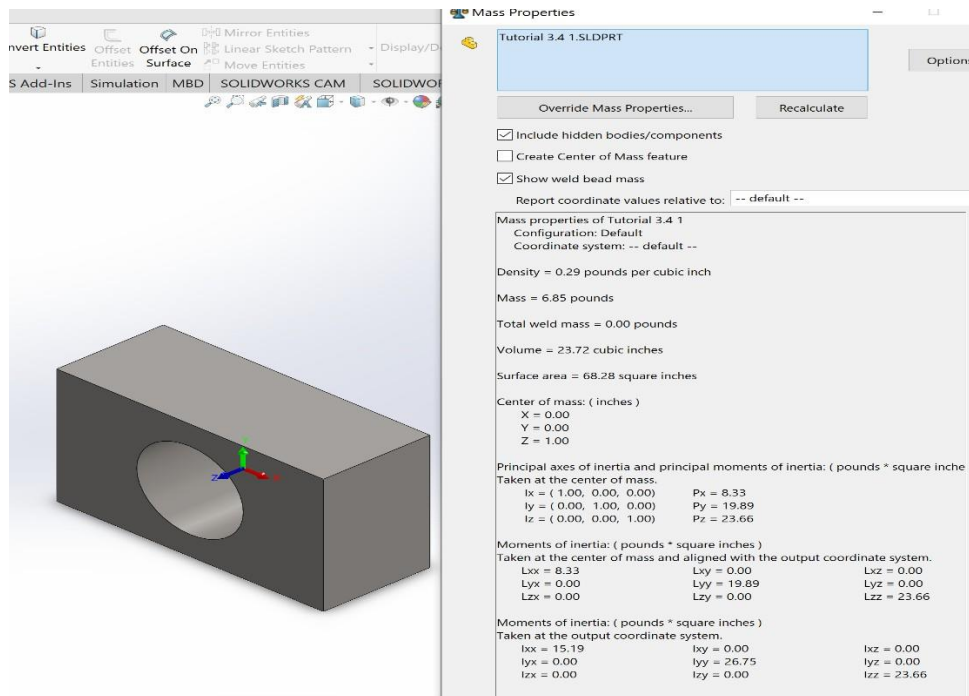
## STEP file

```
Tutorial 3.4 1 - Notepad
File Edit Format View Help
ISO-10303-21;
HEADER;
FILE_DESCRIPTION (( 'STEP AP203' ),
'1' );
FILE_NAME ('Tutorial 3.4 1.STEP',
'2021-02-27T19:00:26',
( '' ),
( '' ),
'SwSTEP 2.0',
'SolidWorks 2020',
'' );
FILE_SCHEMA (( 'CONFIG_CONTROL_DESIGN' ));
ENDSEC;

DATA;
#1 = CARTESIAN_POINT ( 'NONE', ( 5.463695987328526437E-16, 0.0000000000000000, 1.0000000000000000 ) );
#2 = PERSON_AND_ORGANIZATION ( #308, #237 );
#3 = EDGE_CURVE ( 'NONE', #111, #110, #217, .T. );
#4 = DIRECTION ( 'NONE', ( 1.0000000000000000, 0.0000000000000000, 0.0000000000000000 ) );
#5 = CARTESIAN_POINT ( 'NONE', ( 2.50000000000001332, -1.5000000000000222, 1.0000000000000000 ) );
#6 = ORIENTED_EDGE ( 'NONE', *, *, #274, .F. );
#7 = LINE ( 'NONE', #221, #189 );
#8 = CARTESIAN_POINT ( 'NONE', ( 2.50000000000001332, 1.5000000000000222, -1.0000000000000000 ) );
#9 = CARTESIAN_POINT ( 'NONE', ( -2.4999999999999556, 1.5000000000000222, 1.0000000000000000 ) );
#10 = ORIENTED_EDGE ( 'NONE', *, *, #175, .T. );
#11 = ORIENTED_EDGE ( 'NONE', *, *, #234, .F. );
#12 = CC_DESIGN_APPROVAL ( #306, ( #150 ) );
#13 = VECTOR ( 'NONE', #35, 39.37007874015748143 );
#14 = LINE ( 'NONE', #255, #293 );
#15 = LINE ( 'NONE', #257, #179 );
#16 = APPLICATION_CONTEXT ( 'configuration controlled 3d designs of mechanical parts and assemblies' );
#17 = DIRECTION ( 'NONE', ( -0.0000000000000000, -1.0000000000000000, -0.0000000000000000 ) );
#18 = CALENDAR_DATE ( 2021, 27, 2 );
#19 = CARTESIAN_POINT ( 'NONE', ( 0.0000000000000000, 0.0000000000000000, -1.0000000000000000 ) );
#20 = EDGE_CURVE ( 'NONE', #104, #249, #144, .T. );
```



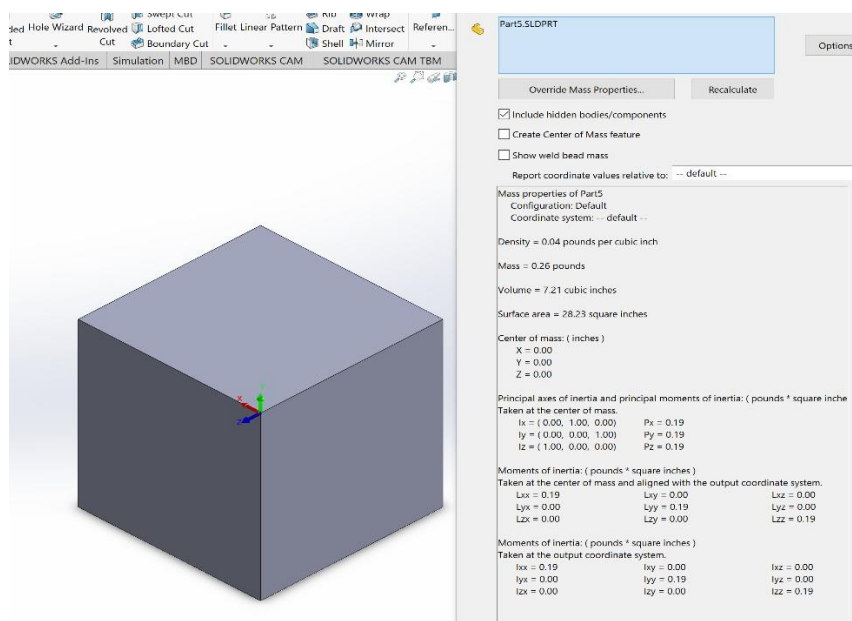
## Handson



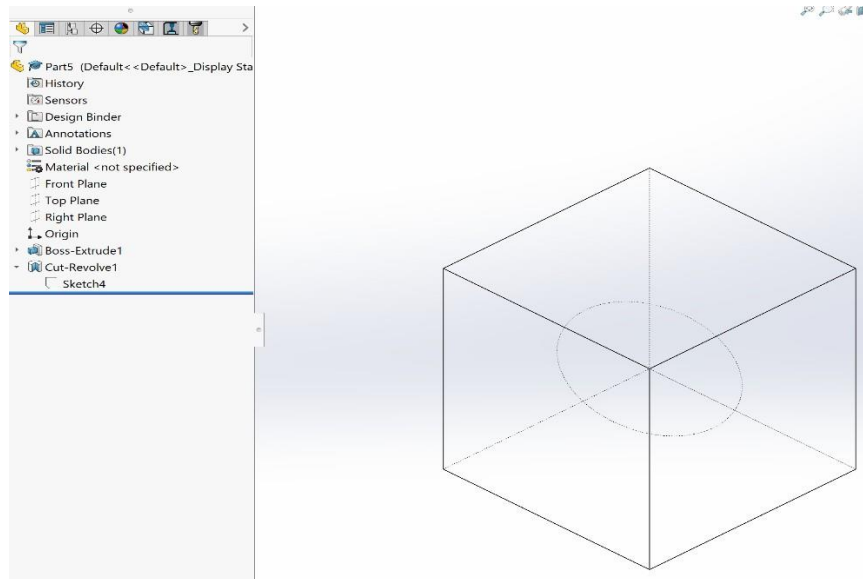
## Hand calculation – Mathematically

Tutorial 3.4 1			All dimensions in inches
Parameter	Dimension (inches)		
Height	3		
Breadth	5		
Width	2		
Circle diameter	2		
Volume of the block	$A = \{L*B*H\}$	30	
Volume of the cylindrical hole	$B = \{Pi*r^2*width\}$	6.285714286	
Total Volume of the part	A-B	23.71428571	
Mass	Density * Volume	6.877142857	
Surface area	$2(lb+bh+hl)-pi*r^2*h+pi*r*H$	68.28571429	

## Mass properties



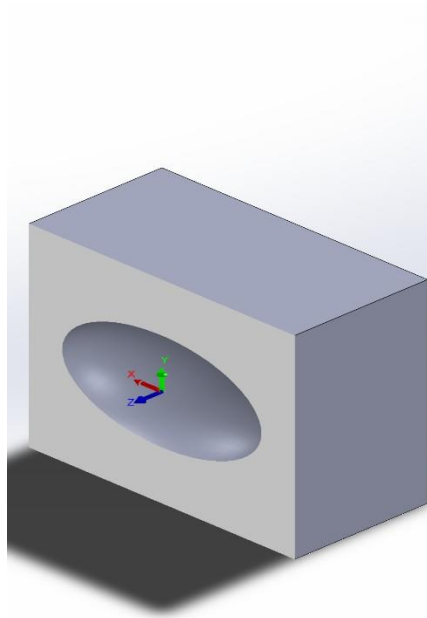
## Model ISO View



## Manual Calculation – Mathematically

Parameter	Formulae	Value
Volume of the ellipsoidal (A)	$\frac{4}{3} \cdot \pi \cdot a \cdot b \cdot c$	0.7854
Volume of the cuboid (B)	$L^3$	8
Total Volume of the part	A-B	7.2146

## Section view of the block with ellipsoidal hole in center



Override Mass Properties... Recalculate

☒ Include hidden bodies/components  
☐ Create Center of Mass feature  
☐ Show weld bead mass

Report coordinate values relative to: -- default --

Mass properties of Part5  
Configuration: Default  
Coordinate system: -- default --

Density = 0.04 pounds per cubic inch  
Mass = 0.26 pounds  
Volume = 7.21 cubic inches  
Surface area = 28.23 square inches

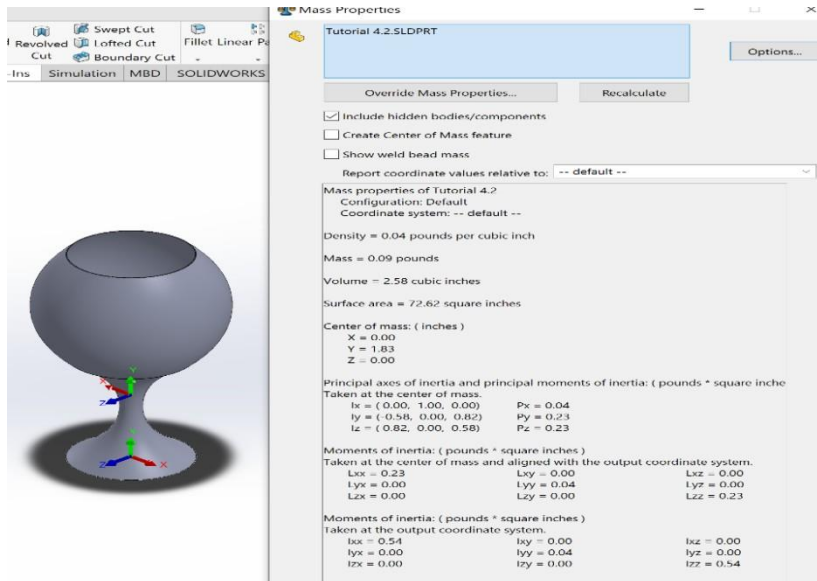
Center of mass: ( inches )  
X = 0.00  
Y = 0.00  
Z = 0.00

Principal axes of inertia and principal moments of inertia: ( pounds \* square inch )  
Taken at the center of mass.  
I<sub>x</sub> = ( 0.00, 1.00, 0.00)      P<sub>x</sub> = 0.19  
I<sub>y</sub> = ( 0.00, 0.00, 1.00)      P<sub>y</sub> = 0.19  
I<sub>z</sub> = ( 1.00, 0.00, 0.00)      P<sub>z</sub> = 0.19

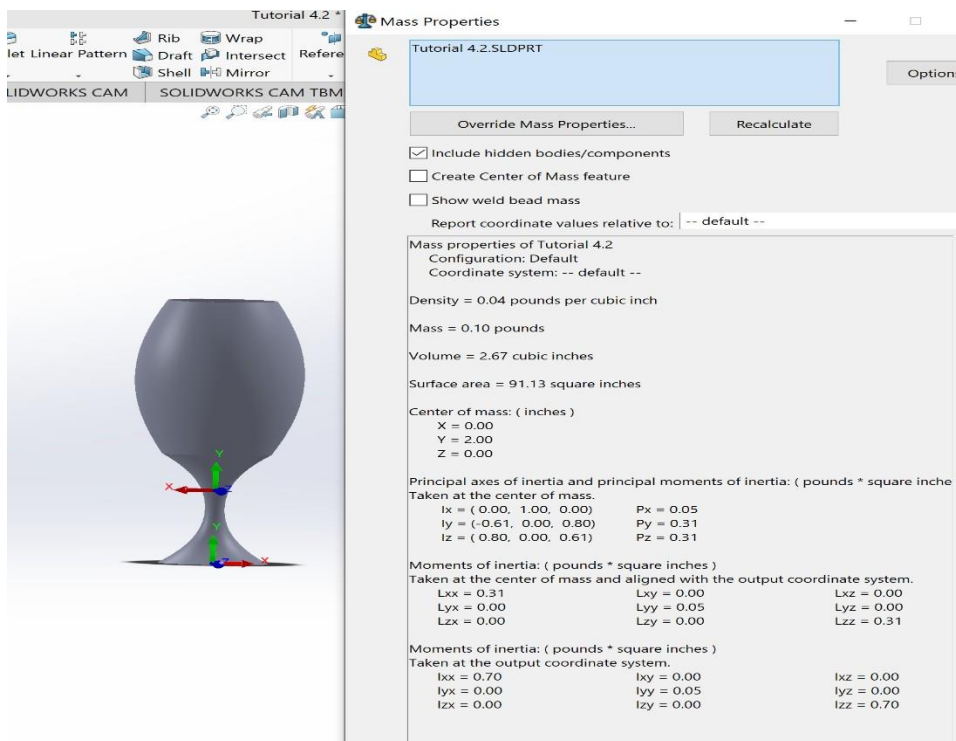
Moments of inertia: ( pounds \* square inches )  
Taken at the center of mass and aligned with the output coordinate system.  
I<sub>xx</sub> = 0.19      I<sub>xy</sub> = 0.00      I<sub>xz</sub> = 0.00  
I<sub>yx</sub> = 0.00      I<sub>yy</sub> = 0.19      I<sub>yz</sub> = 0.00  
I<sub>zx</sub> = 0.00      I<sub>zy</sub> = 0.00      I<sub>zz</sub> = 0.19

Moments of inertia: ( pounds \* square inches )  
Taken at the output coordinate system.  
I<sub>xx</sub> = 0.19      I<sub>xy</sub> = 0.00      I<sub>xz</sub> = 0.00  
I<sub>yx</sub> = 0.00      I<sub>yy</sub> = 0.19      I<sub>yz</sub> = 0.00  
I<sub>zx</sub> = 0.00      I<sub>zy</sub> = 0.00      I<sub>zz</sub> = 0.19

## Mass properties before changing the COM



Redesigned wine glass to have COM located in Plan 2 WITH Y-coordinate = 2in



## Result of the simulation

### SOLIDWORKS FloXpress Report

SOLIDWORKS FloXpress is a first pass qualitative flow analysis tool which gives insight into water or air flow inside your SOLIDWORKS model. To get more quantitative results like pressure drop, flow rate etc. you will have to use SOLIDWORKS Flow Simulation. Please visit [www.solidworks.com](http://www.solidworks.com) to learn more about the capabilities of SOLIDWORKS Flow Simulation.

#### Model

Model Name: Part1.SLDPRT

#### Fluid

Water

#### Inlet

Type	Mass Flow Rate
Faces	Boss-Extrude5//Face
Value	5.0000 kg/s 293.20 K

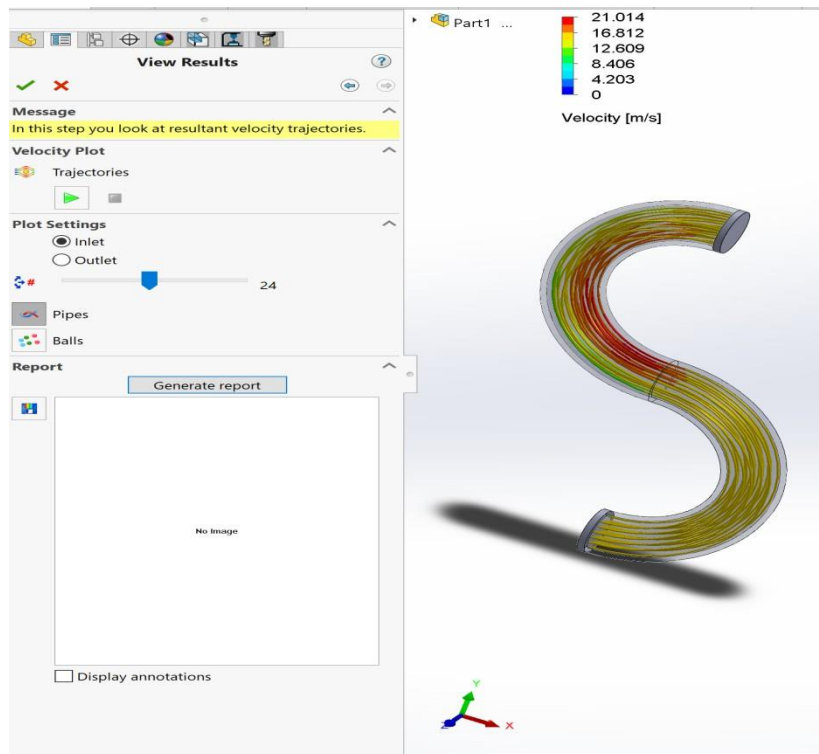
#### Outlet

Type	Environment Pressure
Faces	Boss-Extrude5//Face
Value	101325.00 Pa 293.20 K

#### Results

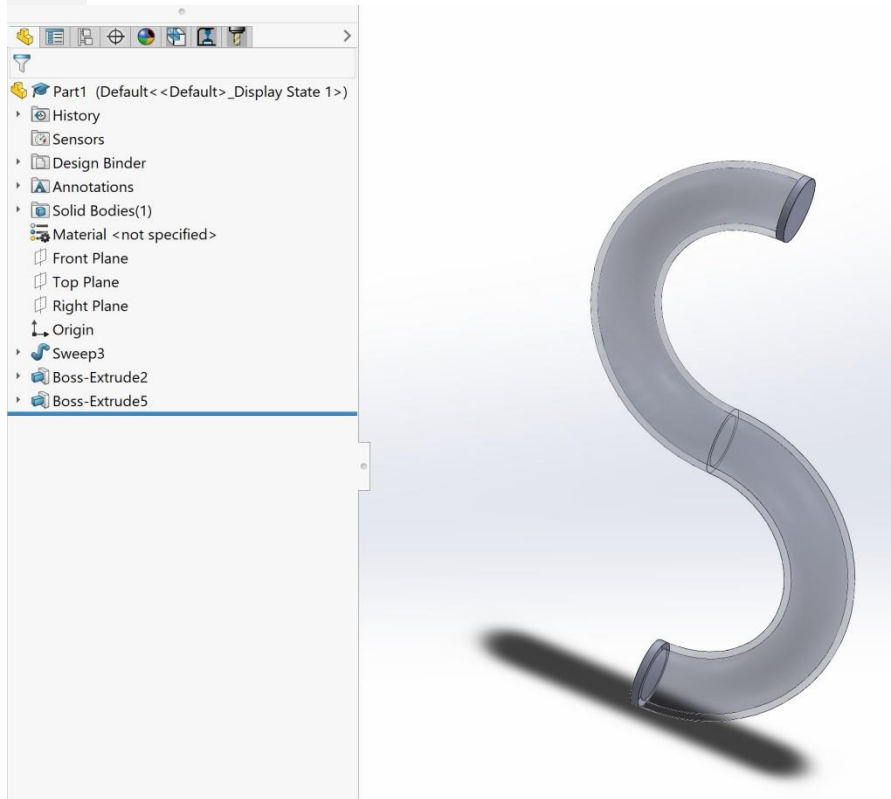
Name	Unit	Value
Maximum Velocity	m/s	20.991

## Flopress simulation



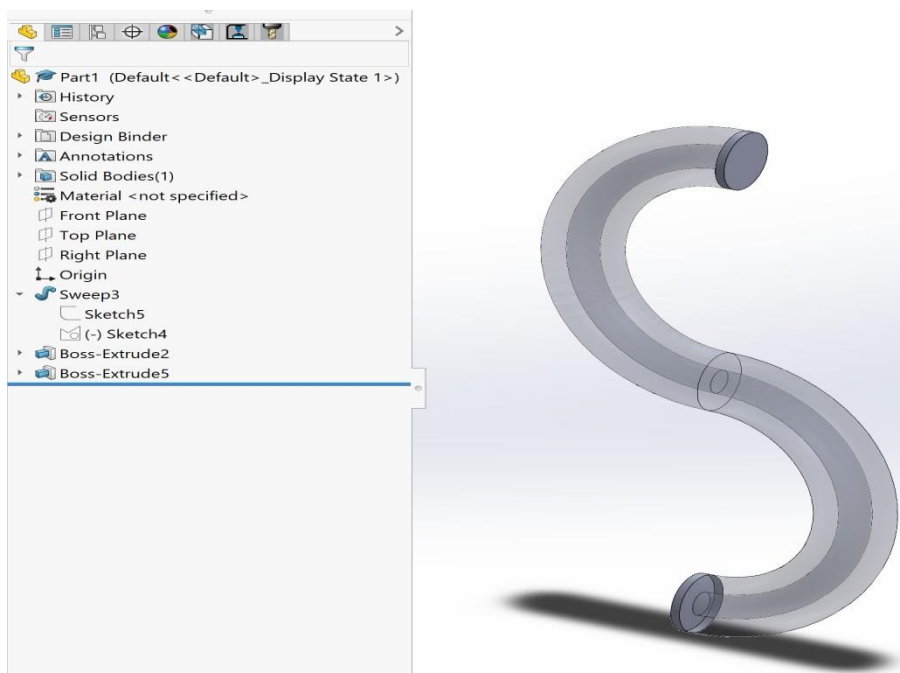


## Model



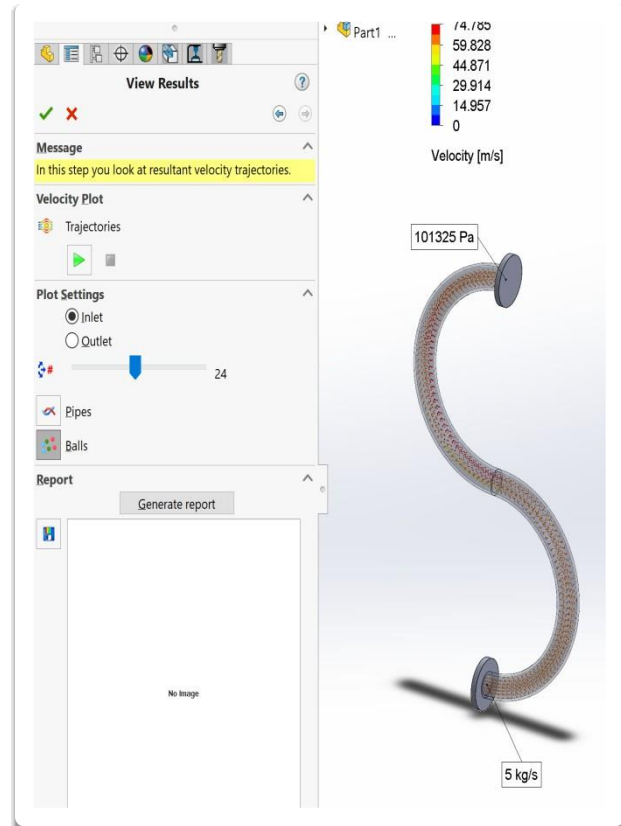
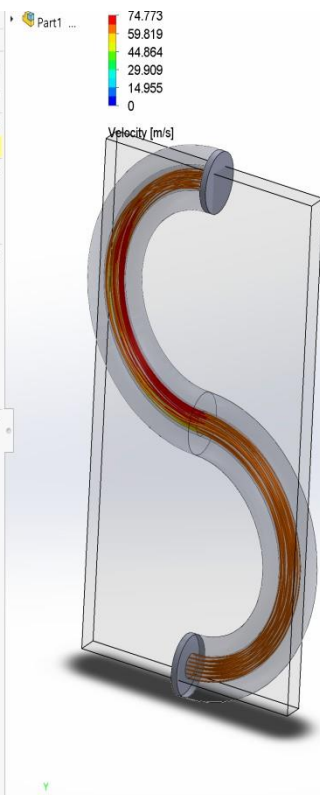
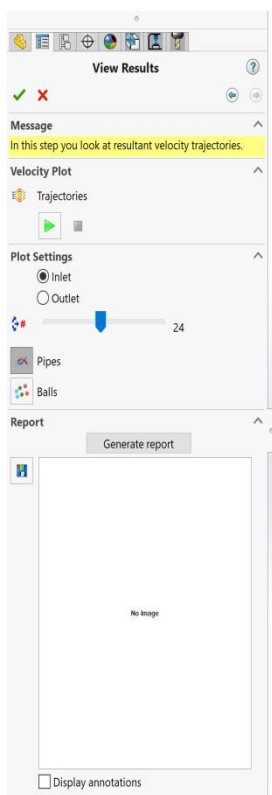
Handson – hose diameter reduced to half

## Model View



## Simulation





Result after reducing the diameter to half (10 mm)

#### SOLIDWORKS FloXpress Report

SOLIDWORKS FloXpress is a first pass qualitative flow analysis tool which gives insight into water or air flow inside your SOLIDWORKS model. To get more quantitative results like pressure drop, flow rate etc. you will have to use SOLIDWORKS Flow Simulation. Please visit [www.solidworks.com](http://www.solidworks.com) to learn more about the capabilities of SOLIDWORKS Flow Simulation.

#### Model

Model Name: Part1.SLDPRT

#### Fluid

Water

#### Inlet

Type	Mass Flow Rate
Faces	Boss-Extrude5//Face
Value	5.0000 kg/s
	293.20 K

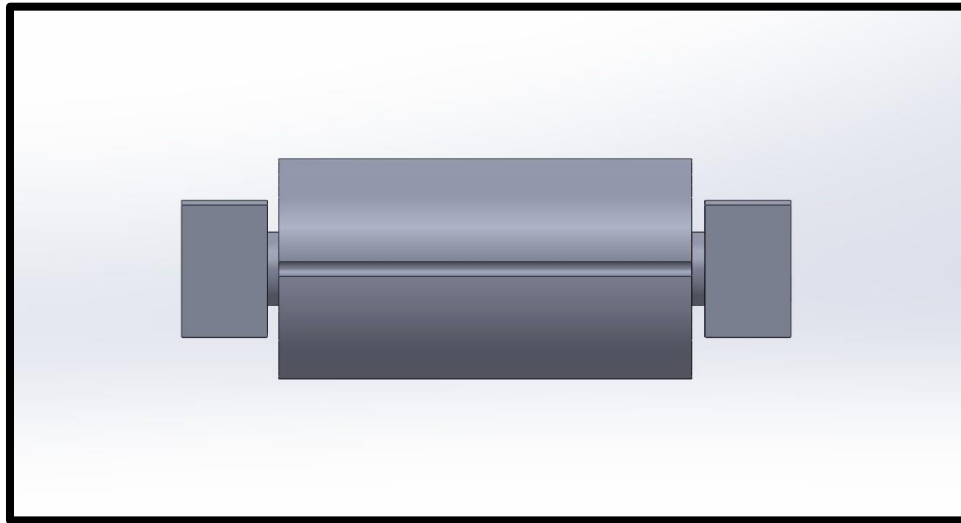
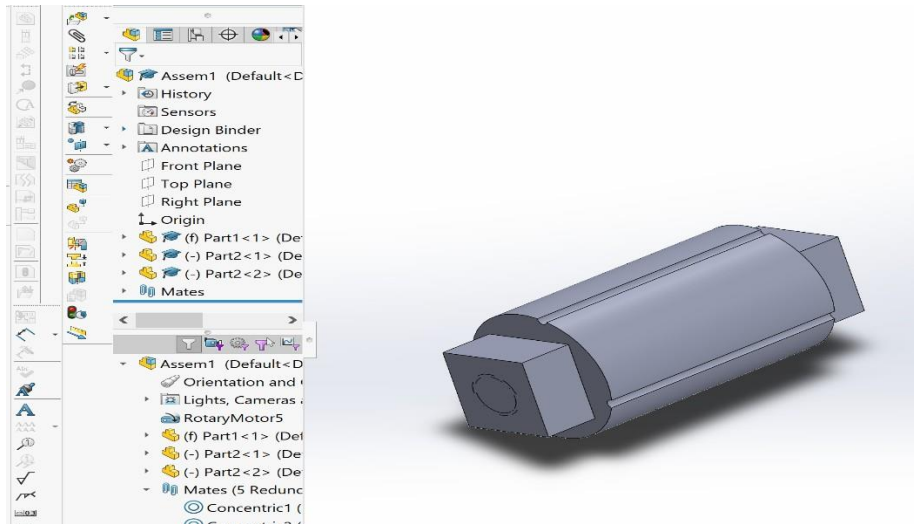
#### Outlet

Type	Environment Pressure
Faces	Boss-Extrude5//Face
Value	101325.00 Pa
	293.20 K

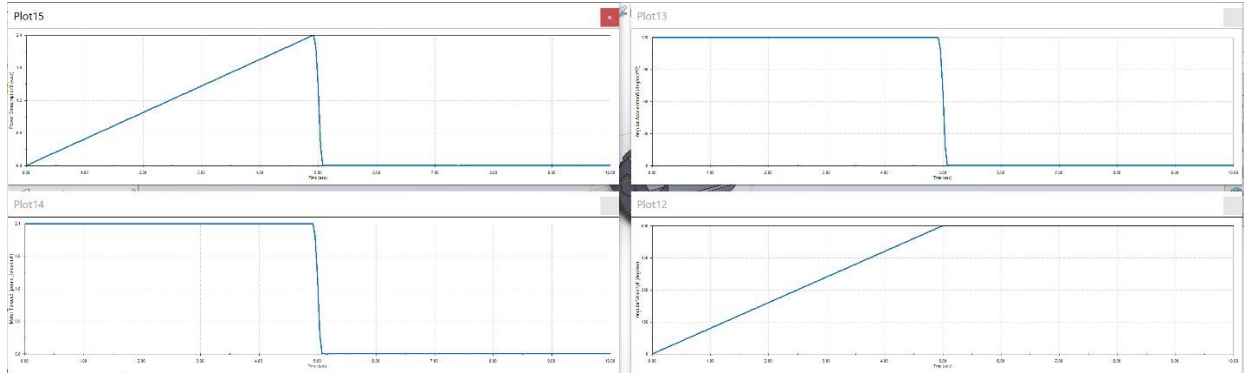
#### Results

Name	Unit	Value
Maximum Velocity	m/s	74.766

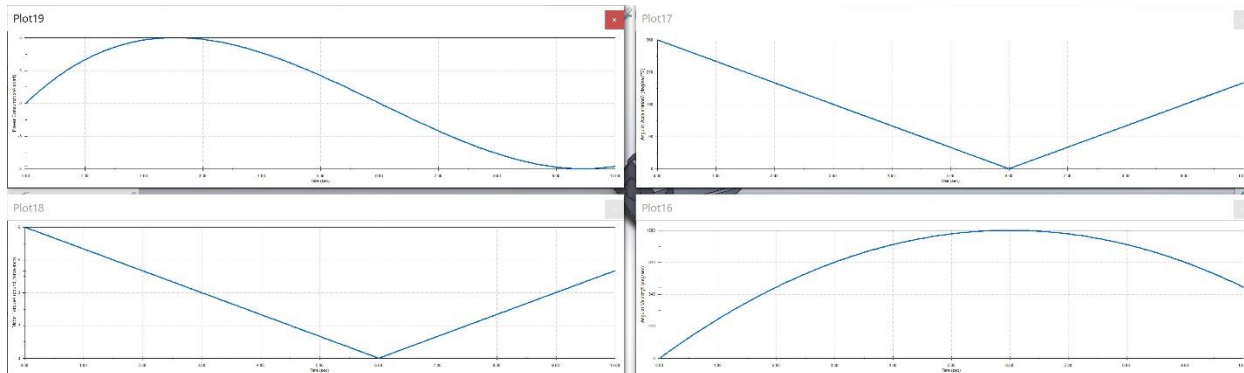
## Model ISO View



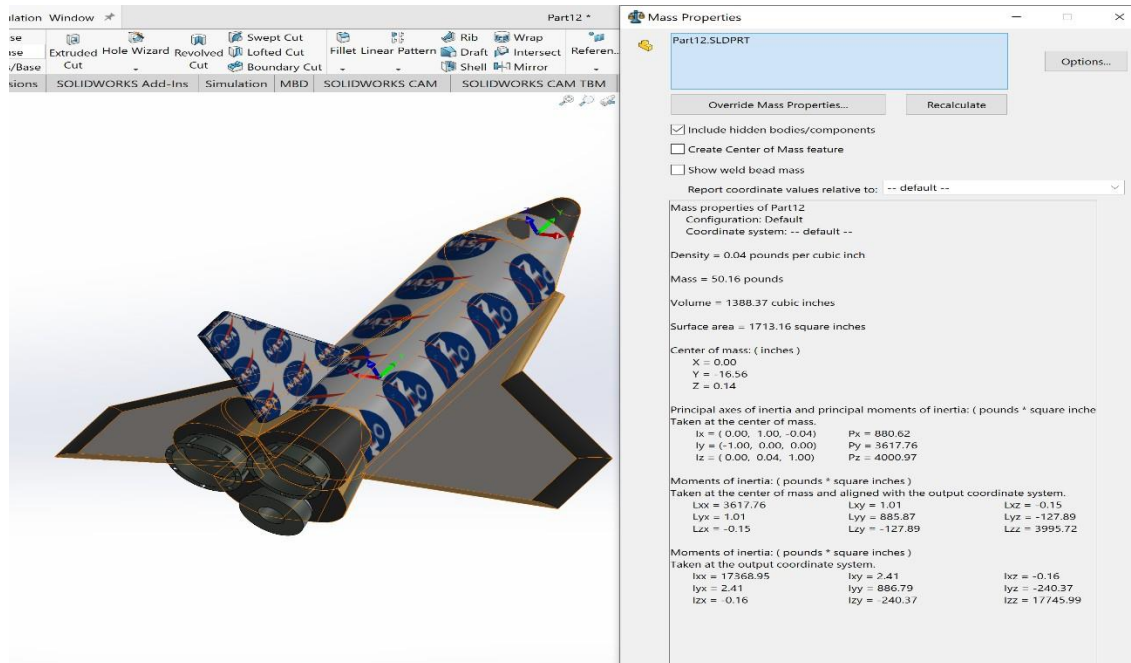
## Linear curves



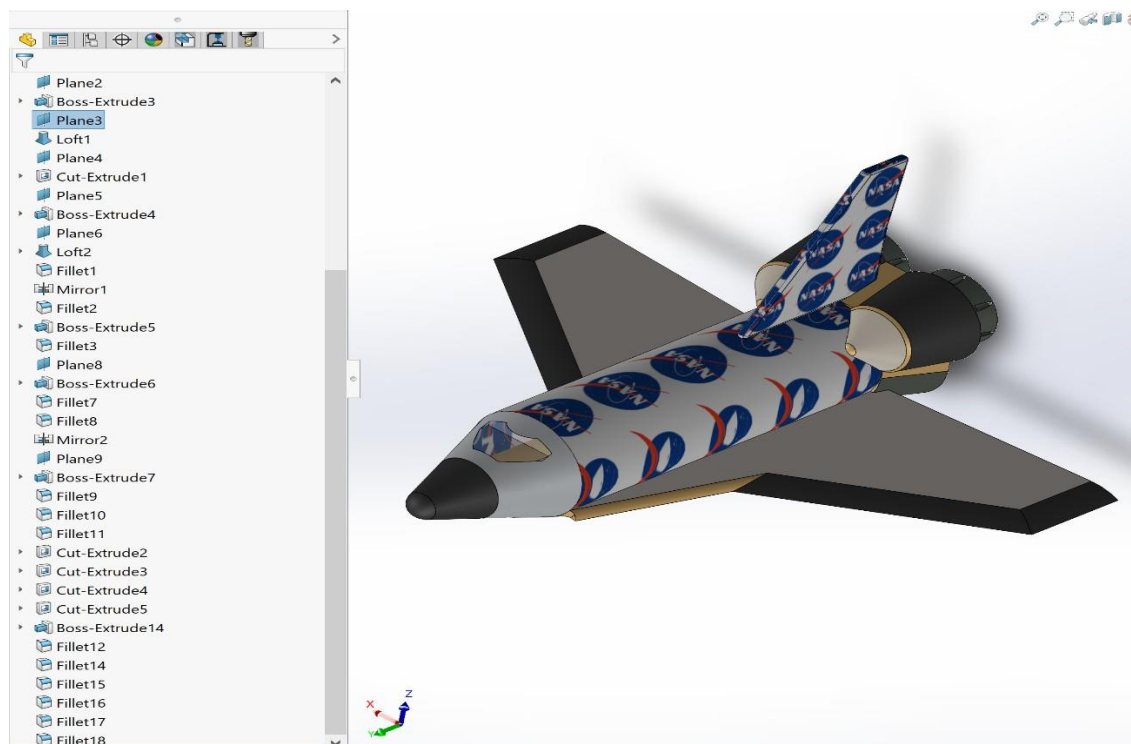
## Handson



The cubic spline distribution changes the nature of motion of the object graph when compared the linear distribution as we can see there is a gradual increase and gradual decrease in velocity of the object over the motion course.



## Model ISO View



the center of mass of a distribution of mass in space is the unique point where the weighted relative position of the distributed mass sums to zero. This is the point to which a force may be applied to cause a linear acceleration without an angular acceleration so here the center of mass is located at the coordinates as per the screenshot to maintain the above said.