

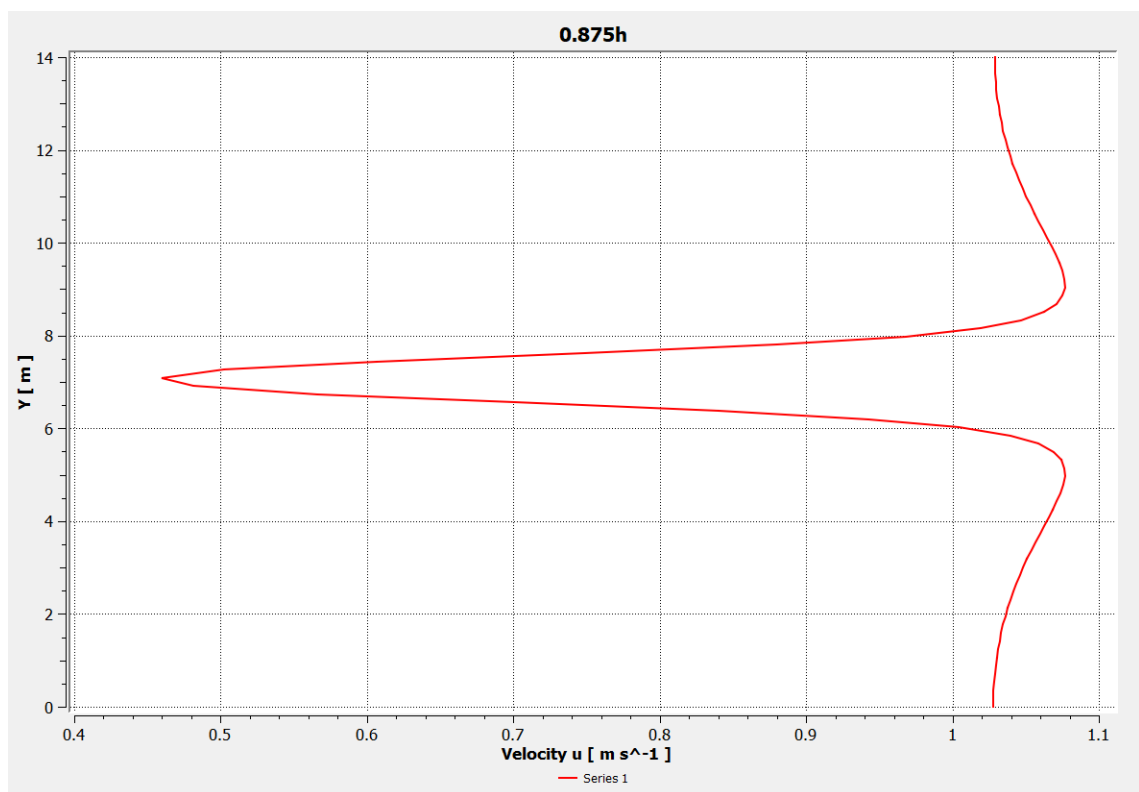
**ME3455**  
**Homework 3**

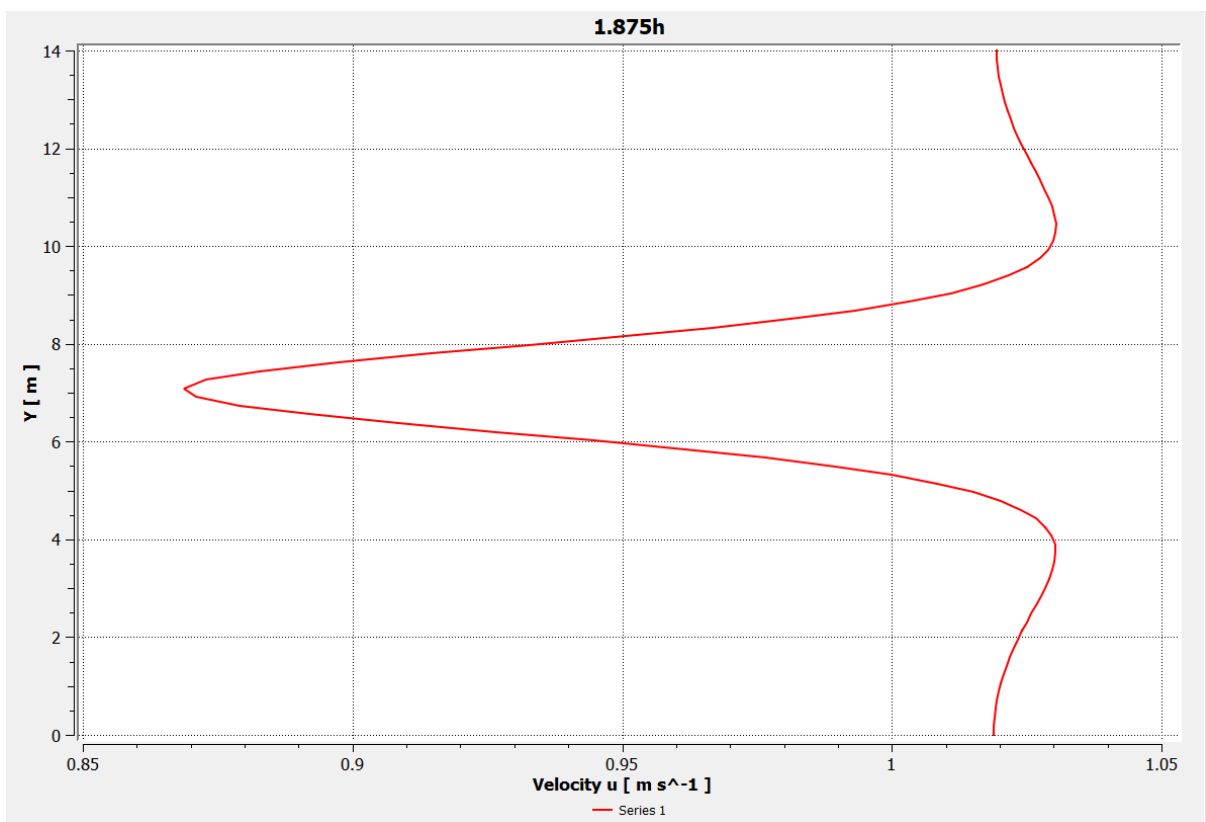
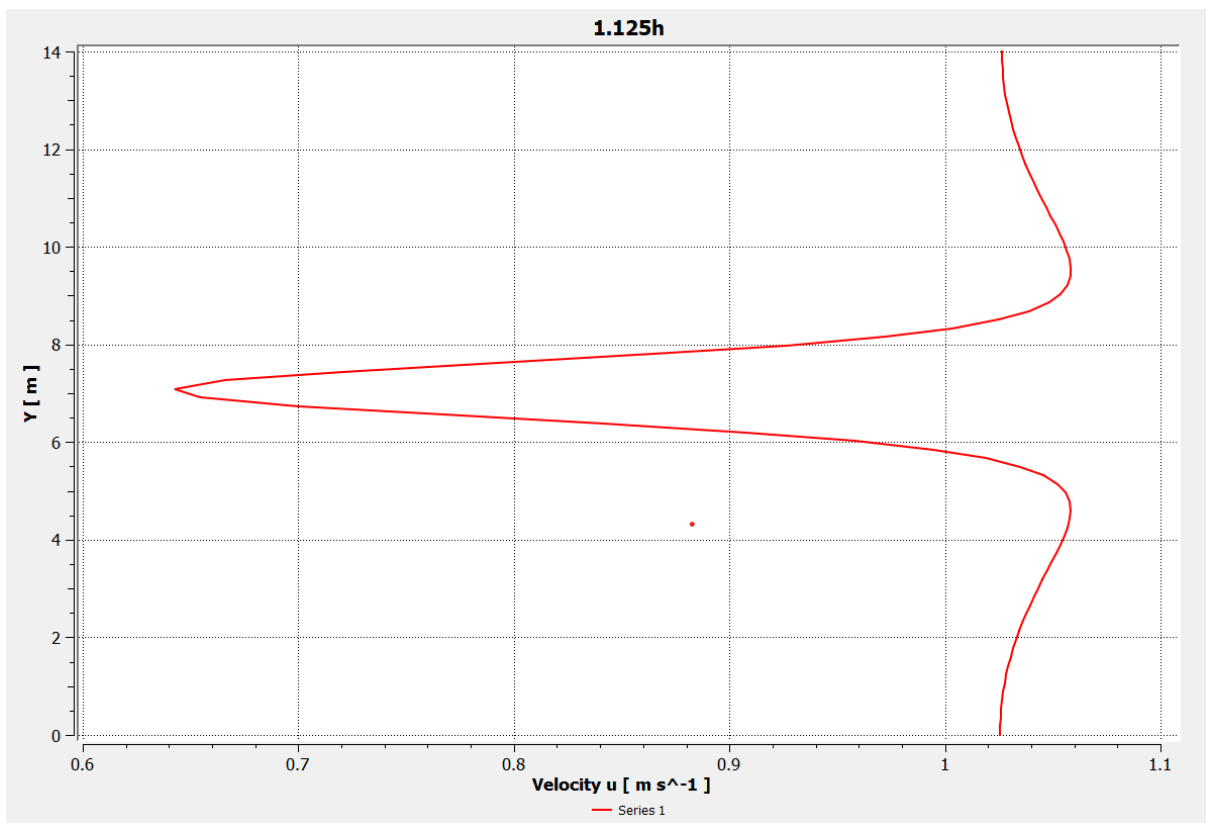
**Abhishek Ghosh**  
**ME21BTECh11001**

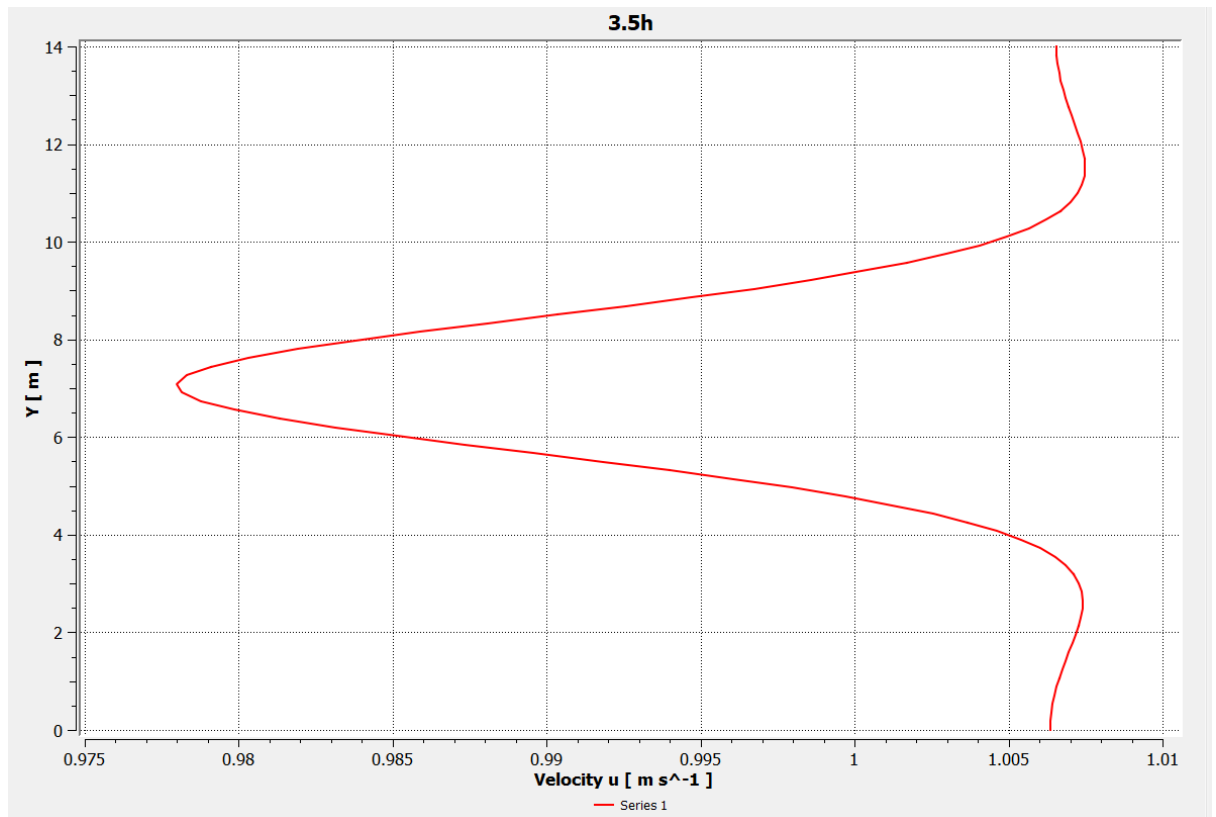
**Question:** Solve for the flow over a square cylinder with the dimensions and solver setting discussed in class. You can use either one of the two meshes that have been shared on classroom, or you can generate your own mesh. Prepare a short report with the following for  $Re = 150$ .

(a)

u vs y

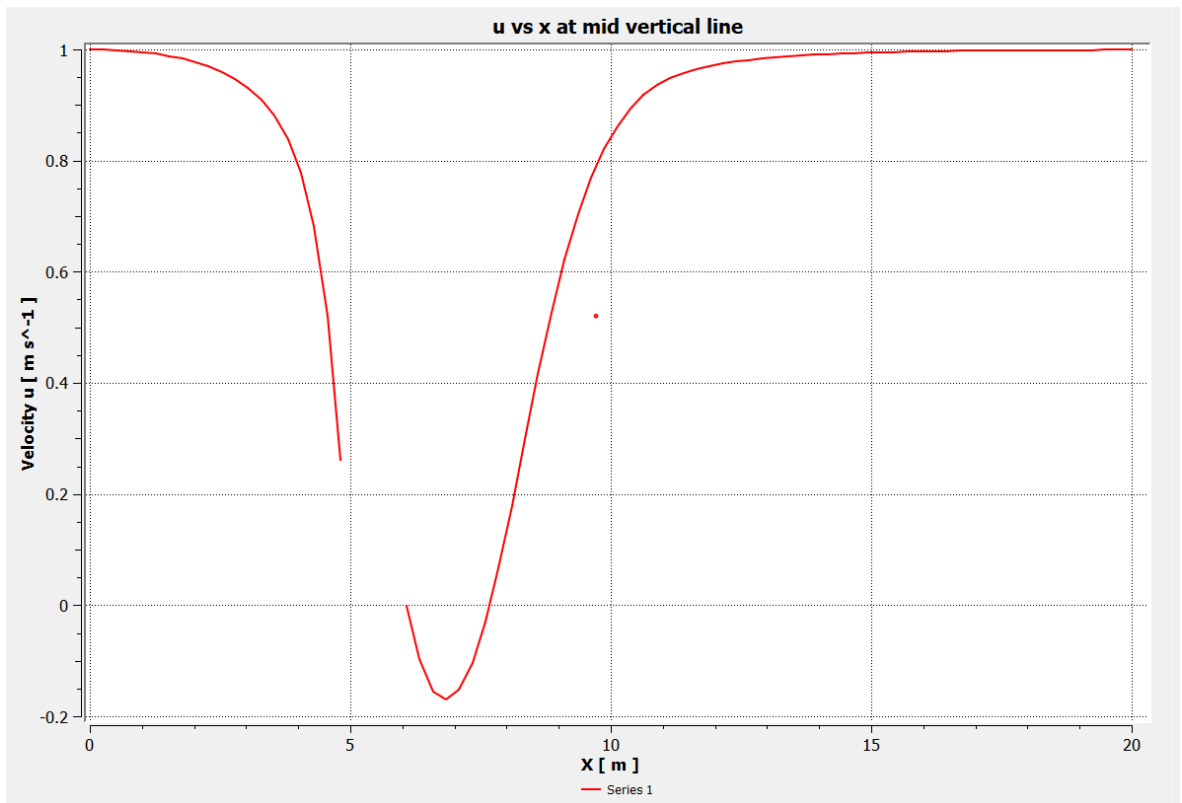






- The velocity around the square cylinder increases and would decrease at direct contact.
- If the axes is brought nearer to the cylinder then the velocity upon direct contact decreases.

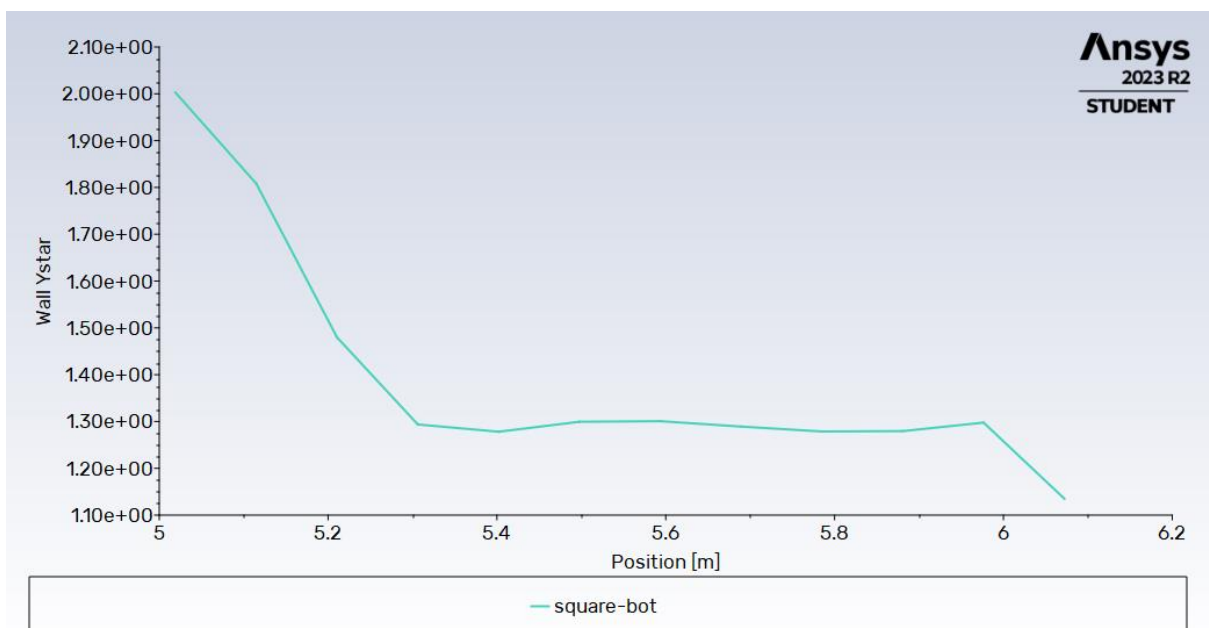
(b)

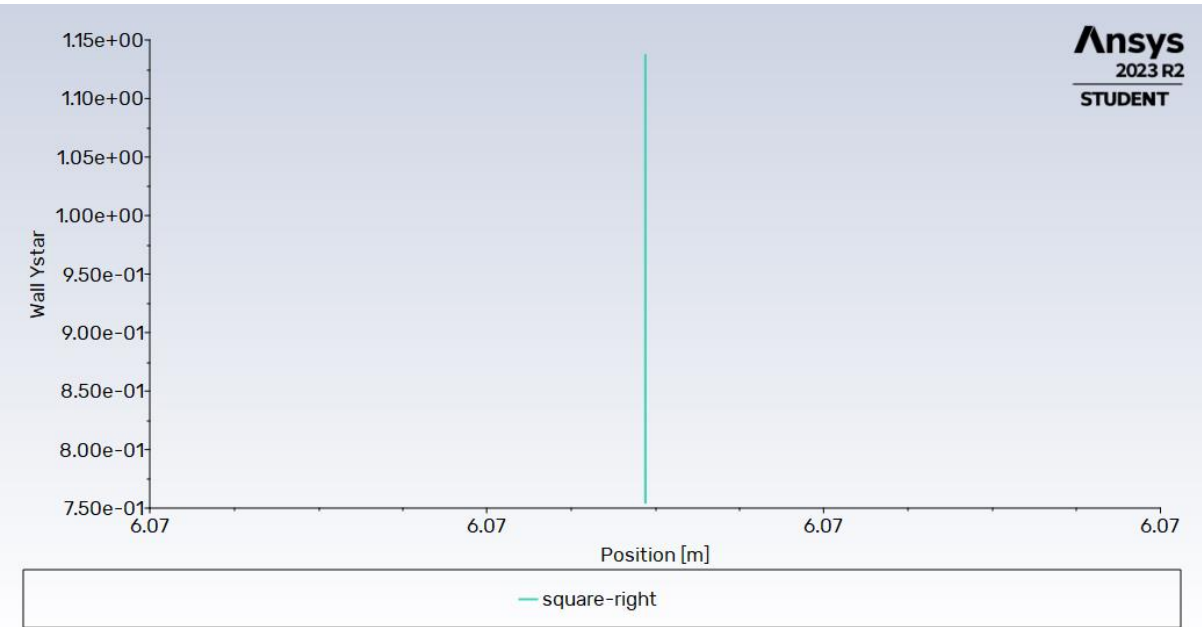
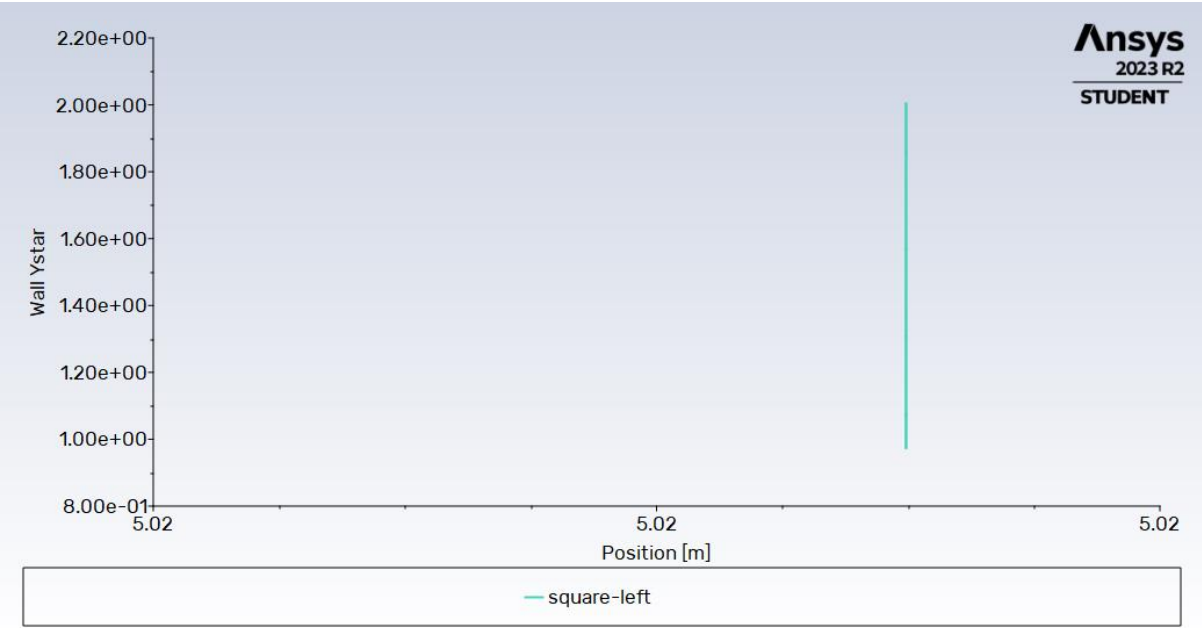


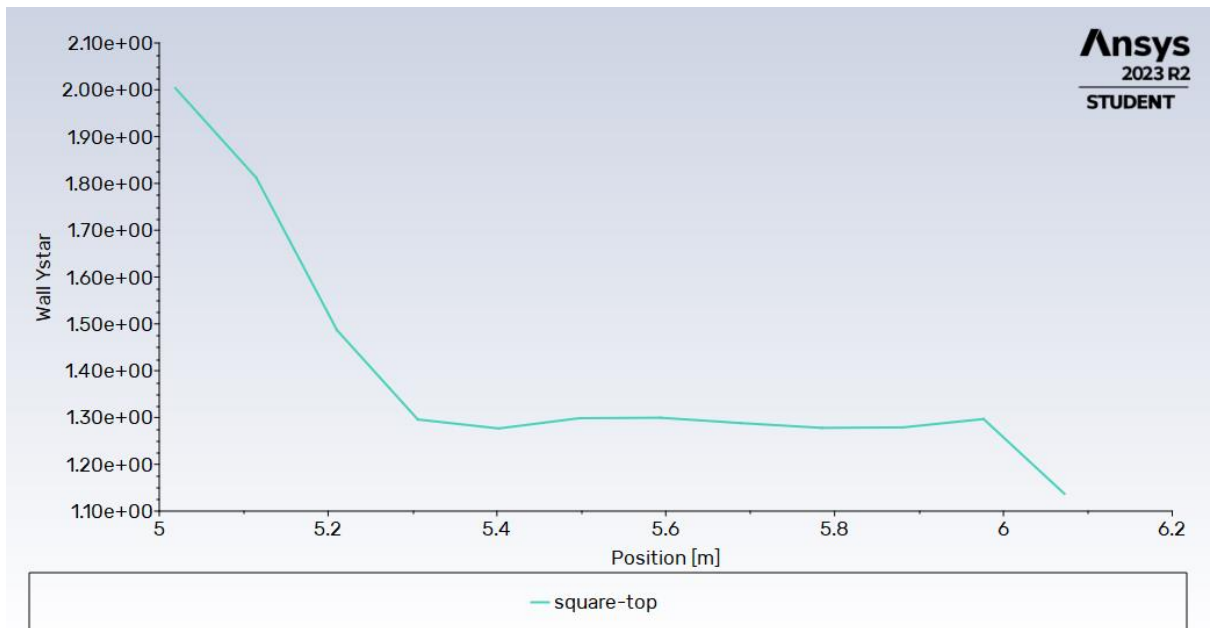
Velocity upon direct contact reduces and velocity on the other side of the cylinder is zero.

After certain time when the flow around the cylinder joins the velocity becomes non zero.

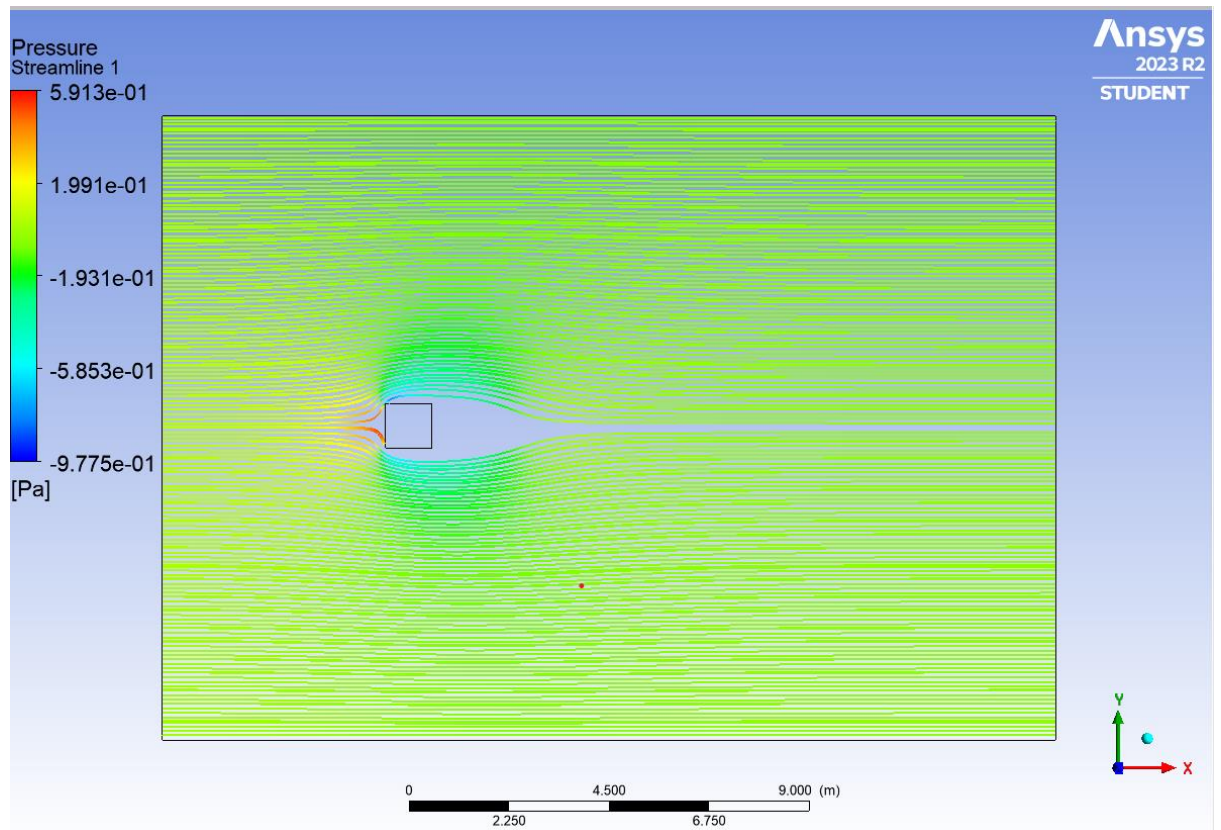
(c)







(d)



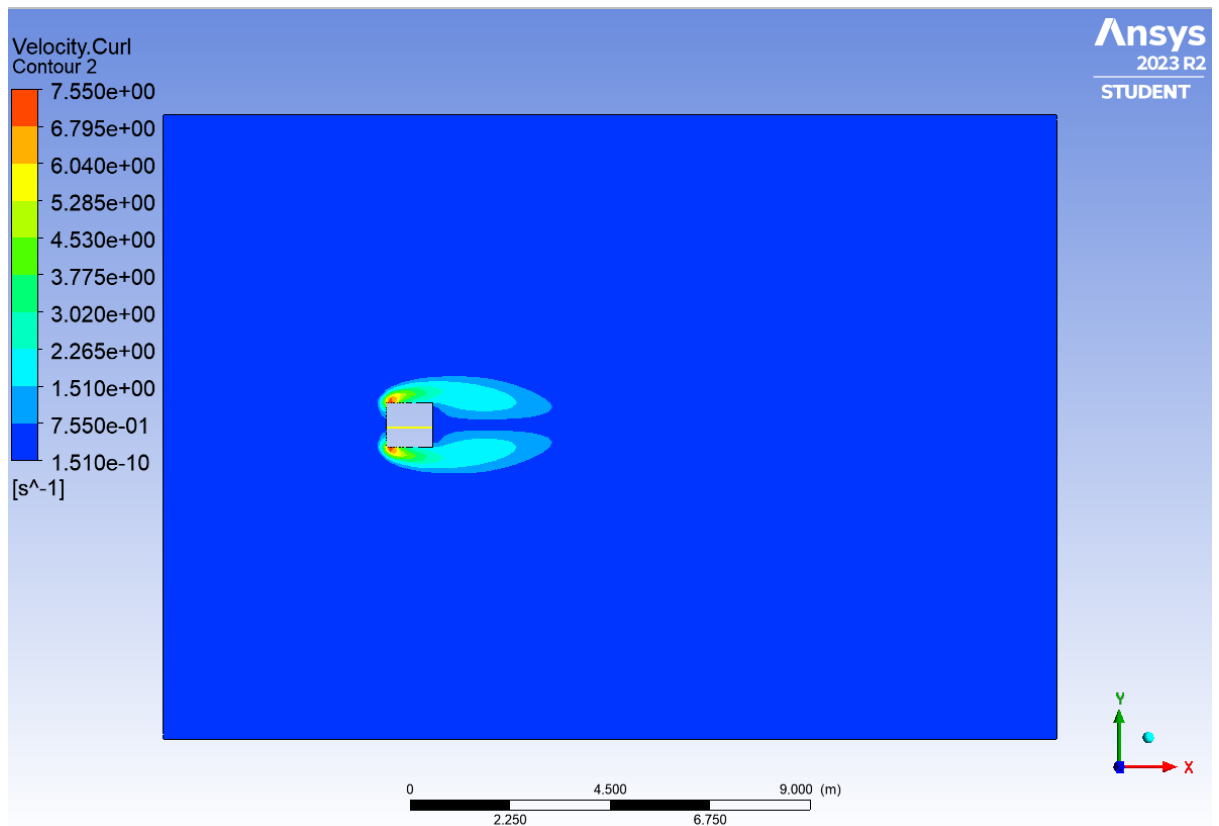
(e)

F27	✓	:	✕	✓	$\sum$	=A27-A34								
	A	B	C	D	E	F	G	H	I	J	K	L	M	
22	4.05E+00	7.78E-01												
23	4.30E+00	6.82E-01												
24	4.56E+00	5.21E-01												
25	4.81E+00	2.62E-01												
26	undef	undef												
27	6.08E+00	-1.69E-03				-1.77E+00								
28	6.33E+00	-9.72E-02												
29	6.58E+00	-1.55E-01												
30	6.84E+00	-1.70E-01												
31	7.09E+00	-1.52E-01												
32	7.34E+00	-1.03E-01												
33	7.59E+00	-2.95E-02												
34	7.85E+00	6.67E-02												
35	8.10E+00	1.79E-01												
36	8.35E+00	2.99E-01												
37	8.61E+00	4.17E-01												
38	8.86E+00	5.26E-01												
39	9.11E+00	6.22E-01												
40	9.37E+00	7.03E-01												
41	9.62E+00	7.68E-01												
42	9.87E+00	8.21E-01												
43	1.01E+01	8.62E-01												
44	1.04E+01	8.94E-01												
45	1.06E+01	9.18E-01												
46	1.09E+01	9.35E-01												
47	1.11E+01	9.48E-01												

- Draw a centreline just behind the cylinder
- Plot x-velocity about this line and export the values in an excel file (from b part).
- In excel we will see values x-velocity start from negative to positive.
- The point at which values of x-velocity becomes positive and its corresponding value of line is Recirculation length.
- In the re-circulation zone the velocity vectors are in the opposite direction of the incident flow, however, at the end of this zone, the velocity vectors change their direction again towards the incident flow direction.
- In the csv file, size of re-circulation bubble =  $7.85 - 6.08 = 1.77$  mm

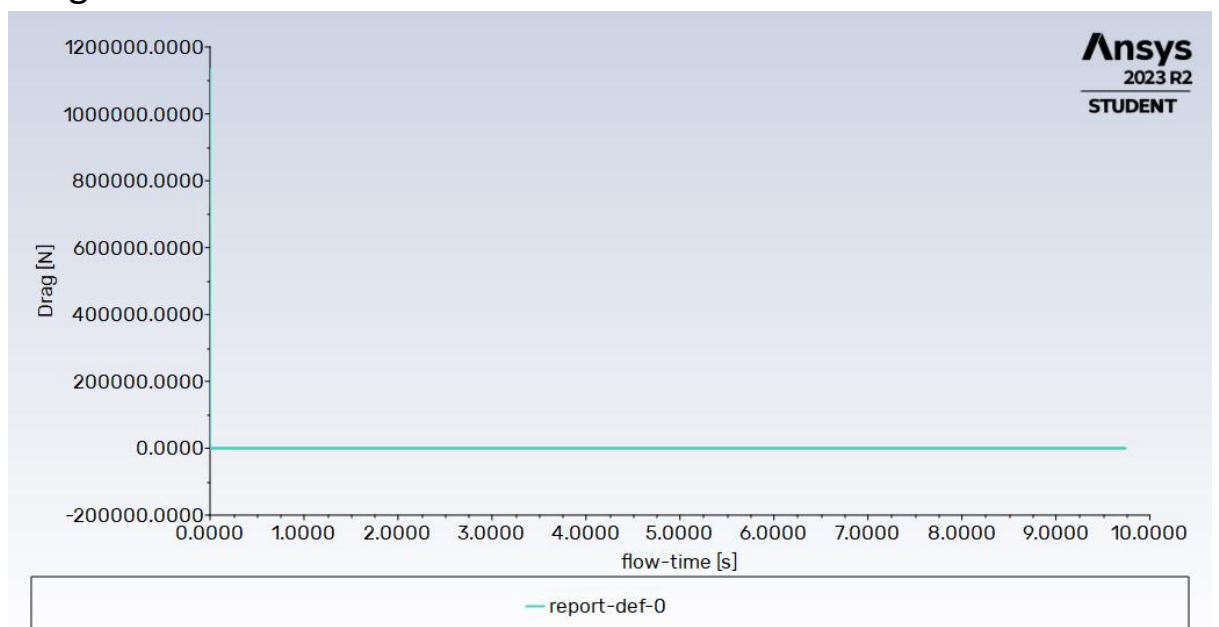
(f)





(g)

Drag



Lift

