Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The Leading Edge theory: a new insight into the laminar Boundary Layer MOHAMMAD GABR[1], Independent Researcher — The flow properties at the leading edge of a flat plate represent a singularity to the Blasius laminar boundary layer equations; by applying the diffusion equation where the velocity of a moving flat plate in a stationary fluid is diffused to the far field, the leading edge velocity profiles are studied. Experimental observations as well as the theoretical analysis show an exact Gaussian distribution curve as the original starting profile of the laminar flow.To conclude; the main key results are as follows:
[1] The velocity profiles at the leading edge of a flat plate are Gaussian Curves that grow in space and time; whereas the Blasius velocity profile is a part of the general Gaussian curves solution.
[2]A new method to calculate the friction drag is successfully tested, based on the displacement area of the leading edge velocity profile.
[3] In order to obtain the final physical proof of the new theory it is recommended to carry out experiments using an ultra-thin flat plate moving in a stationary fluid and measuring the velocity profiles at the leading edge with different measurement techniques.

[1]M.Sc.A. Mechanical Engineering, Polytechnique Montreal

Mohammad Gabr
Independent Researcher

Date submitted: 01 Aug 2019 Electronic form version 1.4