ADVANCED COMPUTATIONAL FLUID DYNAMICS

Computer Assignment 1

BACKWARD FACING STEP USING STREAM FUNCTION – VORTICITY EQUATION

Submitted by:

SANKET RAZDAN

ME17MTECH11022

Programming Parameters:

Initial Guess:

X velocity

u = 1.0

Y velocity

v = 0

Omega (Vorticity)

$\Omega^n = 0.5$ (n_{th} level)

$\Omega^{n+1} = 0.5$ ($n+1_{th}$ level)

Psi (Stream Function)

$\Psi^n = 0.5$ (n_{th} level)

$\Psi^{n+1} = 0.5$ ($n+1_{th}$ level)

Grid Size:

$N_x = 100$ (No. of cells in X axis)

$N_y = 50$ (No. of cells in X axis)

Time Steps:

t = 50.0 (Total time)

dt = 0.01

So, number of time steps = 5000

Error term:

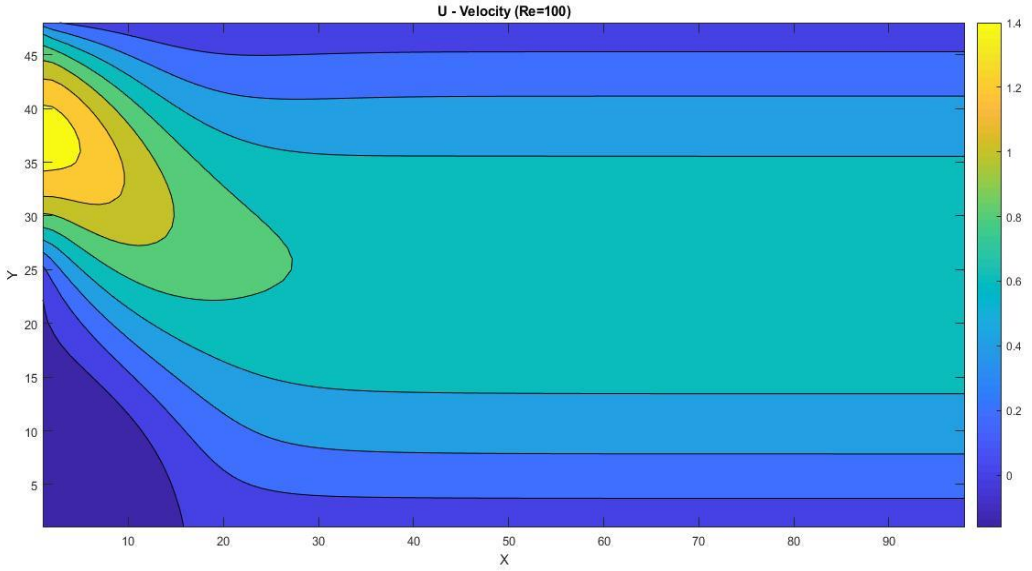
$e = 10^{-5}$

OBSERVATIONS:

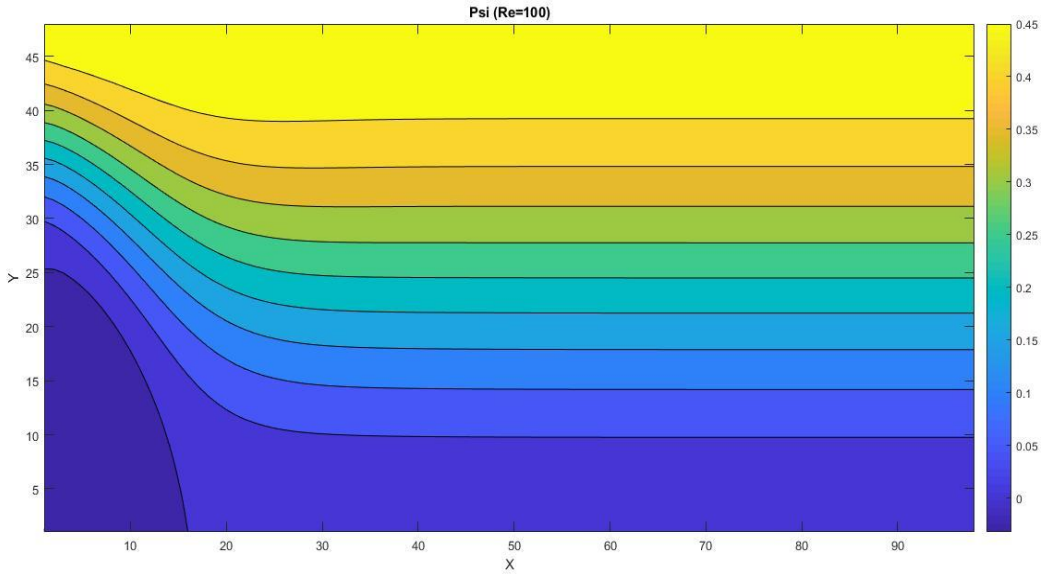
Reynolds Number (Re) = 100

Recirculation Length – 1.51515

Velocity Profile



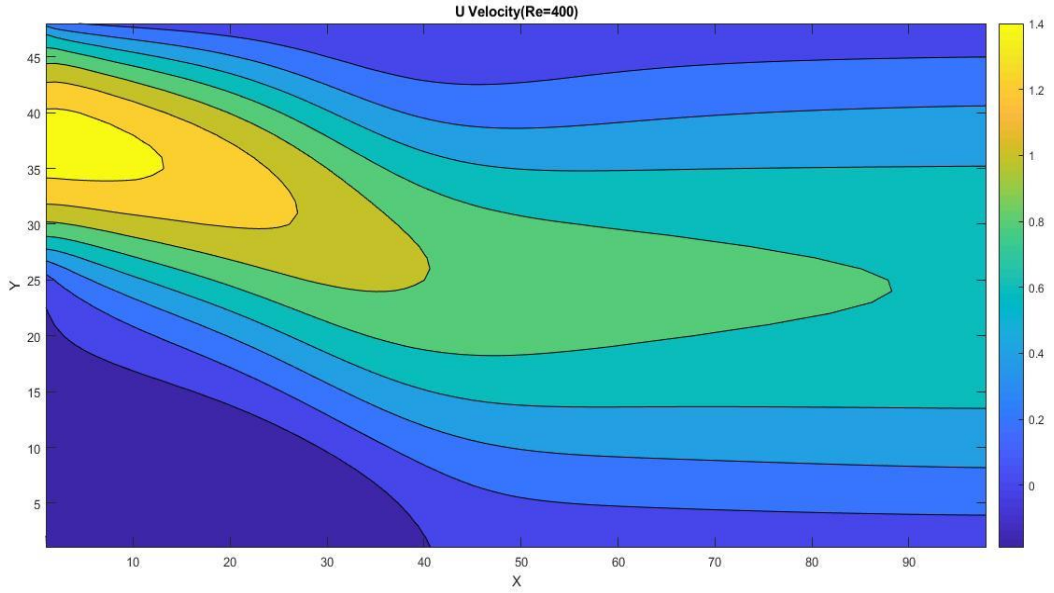
Stream Function Profile



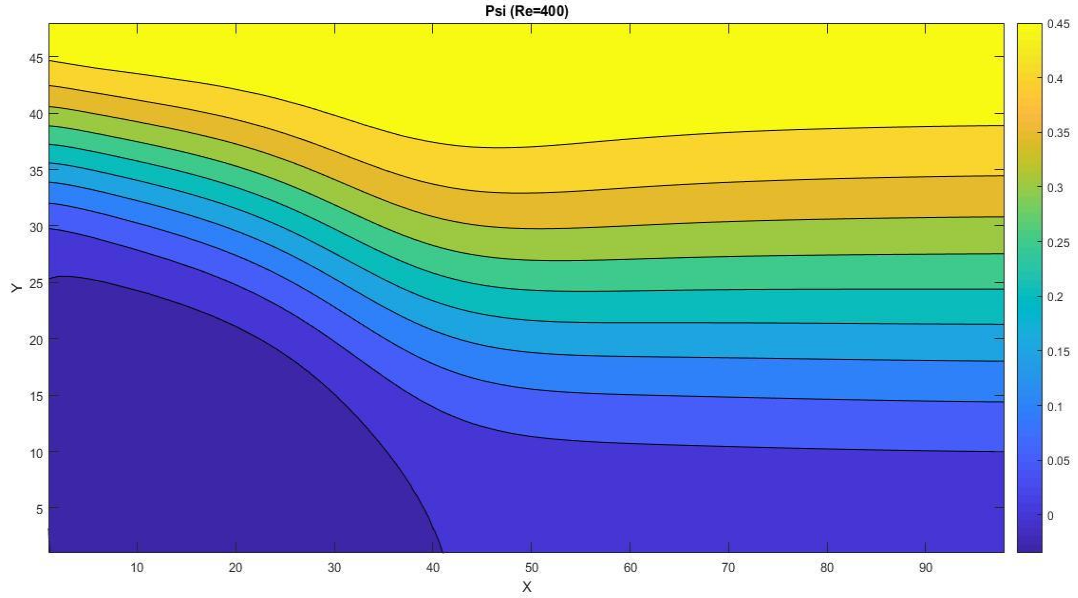
Reynolds Number (Re) = 400

Recirculation Length – 3.93939

Velocity Profile



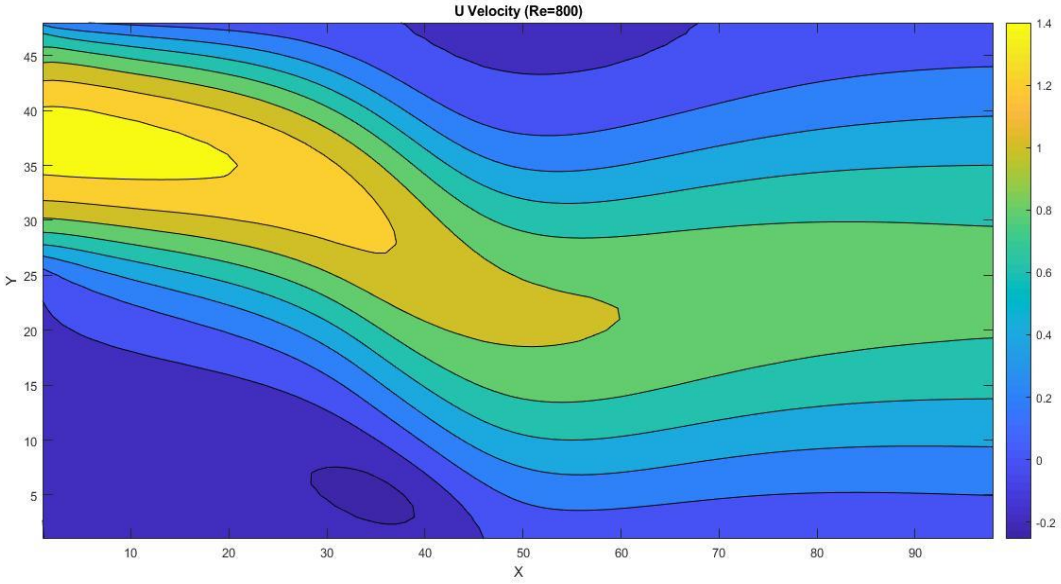
Stream Function Profile



Reynolds Number (Re) = 800

Recirculation Length – 4.44

Velocity Profile



Stream Function Profile