Name_____   Lab Section_____

Turbulence Lab Worksheet
CE 319F Elementary Mechanics of Fluids
Department of Civil, Architectural and Environmental Engineering
The University of Texas at Austin

The equation for the Reynolds number is:

$$Re = \frac{\overline{u}\, L}{\nu}$$

The thickness of the boundary layer at the point of measurement can be calculated as:

$$\delta = \frac{0.37\, x}{Re_x^{\frac{1}{5}}}$$

The shear stress at the wall is:

$$\tau_0 = \mu \frac{du}{dy}$$

In our PIV experiment:

Mean flow Velocity $\overline{u} = 0.066$ m/s

Characteristic dimension L= 3.2 m (distance from the inlet of the flume to the point of measurement)

At 20°C for water, $\nu = 10^{-6}$ m²/s

From the PIV measurements, we obtain the velocity gradient at the wall $\frac{du}{dy} = 6.5$

1) Calculate the Reynolds number

   Re = _____

2) Calculate the boundary layer thickness for a temperature of 20°C at a distance 3.2 m from the inlet.

   δ = _____

3) Calculate the wall shear stress

   τ_0 = _____