

## Question 1

*Provide a clean contour plot of the flow velocity that clearly illustrates the mixing of two streams of air. Particularly, what do these contour results indicate about the flow physics? Use screenshots and other illustrations to support your statement.*

### Solution

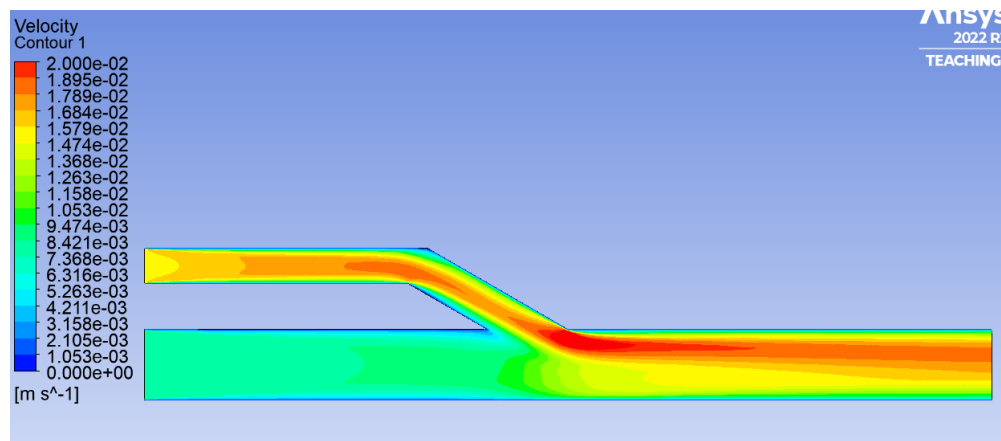


Figure 1: Contour plot of the flow velocity

The contour plot of the flow velocity is shown in Figure 4. The plot clearly illustrates the mixing of two streams of air. The plot indicates that the higher velocity flow ‘pushes’ down the lower velocity field. As the flow continues, the stream seems to ‘mix’ the velocities to an average velocity as it approaches the outlet.

For both the upper and lower flows, a boundary layer can be seen developing starting from the inlet. The boundary layer is more pronounced for the upper flow.

Also, the velocity of the upper stream increases around the corner where the flows mix.

## Question 2

*Provide a clean vector plot of the flow velocity that clearly illustrates the mixing of two streams of air. Particularly, what do these vector results indicate about the flow physics? Use screenshots and other illustrations to support your statement.*

### Solution

The velocity plot shows much of the same information as the contour plot. The plot clearly illustrates the mixing of two streams of air. The plot indicates that the higher velocity flow ‘pushes’ down the lower velocity field. As the flow continues, the stream seems to ‘mix’ the velocities to an average velocity as it approaches the outlet.

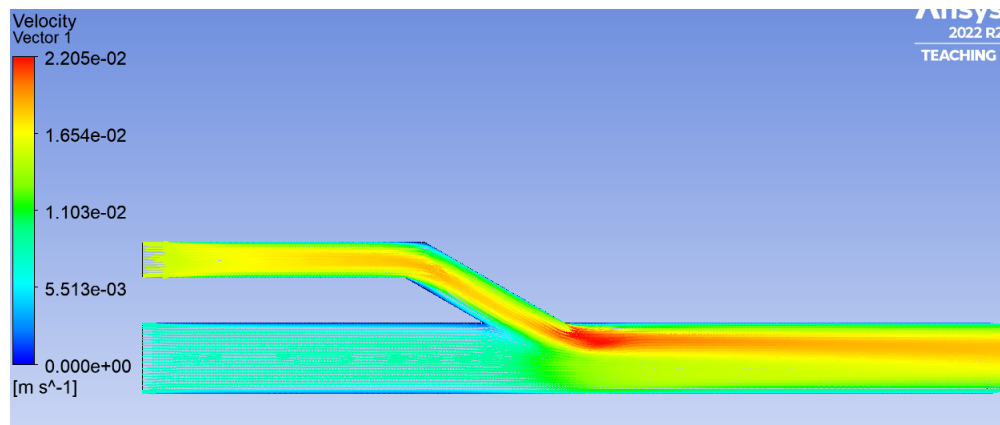


Figure 2: Vector field plot of the flow velocity

For both the upper and lower flows, a boundary layer can be seen developing starting from the inlet. The boundary layer is more pronounced for the upper flow.

Also, the velocity of the upper stream increases around the corner where the flows mix.

### Question 3

*Provide a clean 2D streamline plot of the flow velocity that clearly illustrates the mixing of two streams of air. Particularly, what do these vector results indicate about the flow physics? Use screenshots and other illustrations to support your statement.*

### Solution

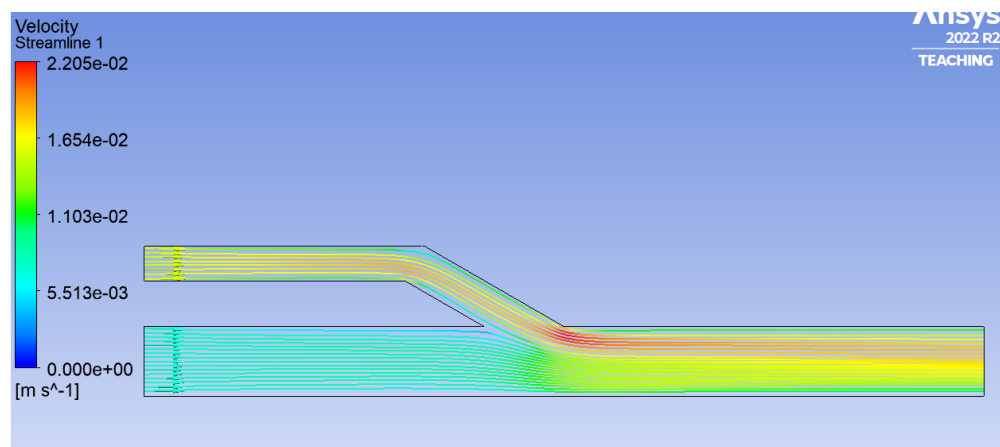


Figure 3: Streamline plot of the flow velocity

The streamline plot of the flow velocity is shown in Figure 4. The plot shows practically the same information as the contour plot and the vector plot.

The plot clearly illustrates the mixing of two streams of air. The plot indicates that the higher velocity flow ‘pushes’ down the lower velocity field. As the flow continues, the stream seems to ‘mix’ the velocities to an average velocity as it approaches the outlet.

For both the upper and lower flows, a boundary layer can be seen developing starting from the inlet. The boundary layer is more pronounced for the upper flow.

Also, the velocity of the upper stream increases around the corner where the flows mix.

## Question 4

*Provide a two-screen representation of the flow (vertically-side by side) for either 2 of the 3 plots you have shown in Tasks 1 - 3. Provide a description of how combining these flow illustrations will assist your understanding of the flow physics. Use screenshots and other illustrations to support your statement.*

## Solution

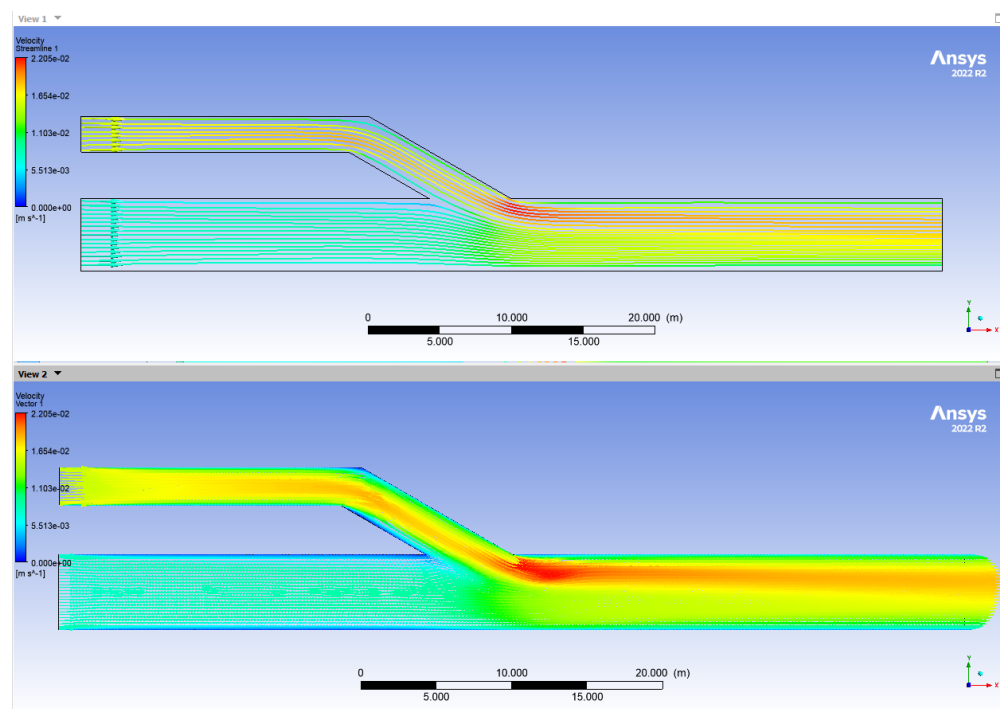


Figure 4: Streamline and vector plot of the flow velocity

The streamline plot follows the tangential direction of the flow, showing the path taken by a particular fluid particle. The vector plot shows the magnitude and direction of the flow at a particular point.

The streamline plot is useful if we want to see the path taken by a particular fluid particle. The vector plot is useful if we want to see the magnitude and direction of the flow at a particular point or if we want to see the flow field as a whole.