4 Fluid Kinematics

4.2 Flow Patterns and visualization.

(Fluid Mechanics, Cengel, 3rth)

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It's better to explaing using examples. Process to solve is explained in book. So, let's get straight into it.

Steady Flow (It does not depend on time)

Let a 2-D velocity vector field be:

$$\overrightarrow{V}(x,y,t) = ui + vj$$
$$\overrightarrow{V}(x,y,t) = (0.5 + 0.8x)i + (1.5 - 0.8y)j$$

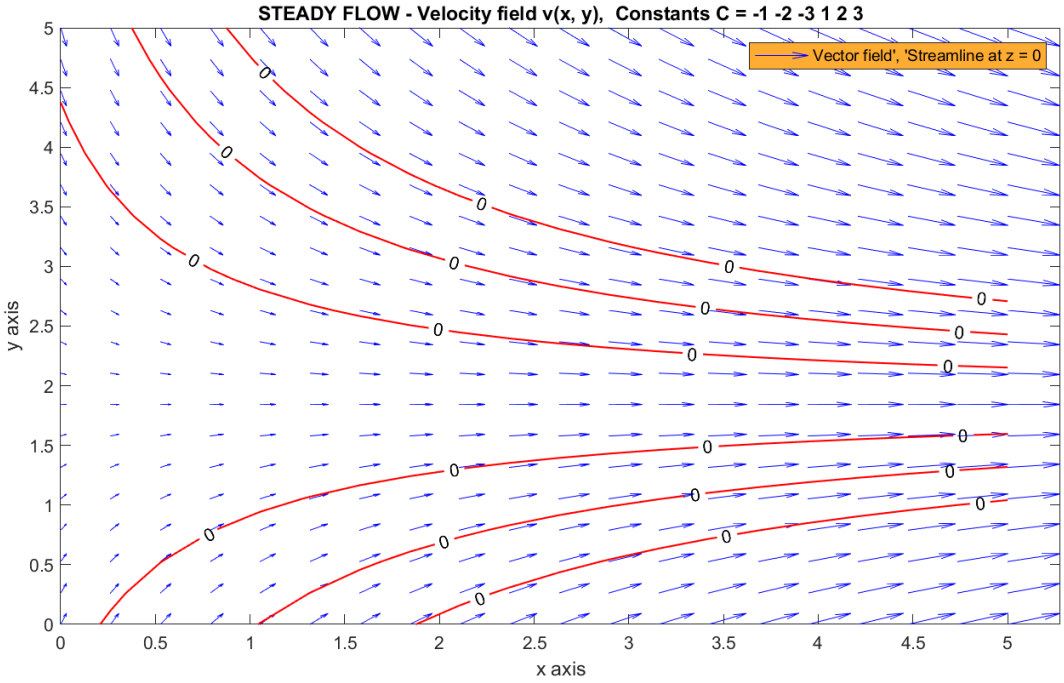
By solving the equation, solution is:

$$y = \frac{C}{0.8(0.5 + 0.8x)} + 1.875,\ C = constant$$

To represent the fluid pattern, it takes to give form to the general expression of function $z = f(x,y,t)$:

$$z = f(x,y,t) = y - \frac{C}{0.8(0.5 + 0.8x)} - 1.875 = 0$$

Represent fluid in a 2-D plane. For differents values of constant C

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DONE!
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Unsteady Flow (It does depend on time)

Let a 2-D velocity vector field be:

$$\overrightarrow{V}(x,y,t) = ui + vj$$
$$\overrightarrow{V}(x,y,t) = xi + (-y * t)j$$

**It is spacial 2-D, and 1-D in time.*

By solving the equation, solution is:

$$y = C * x^{-t},\ C = constant$$

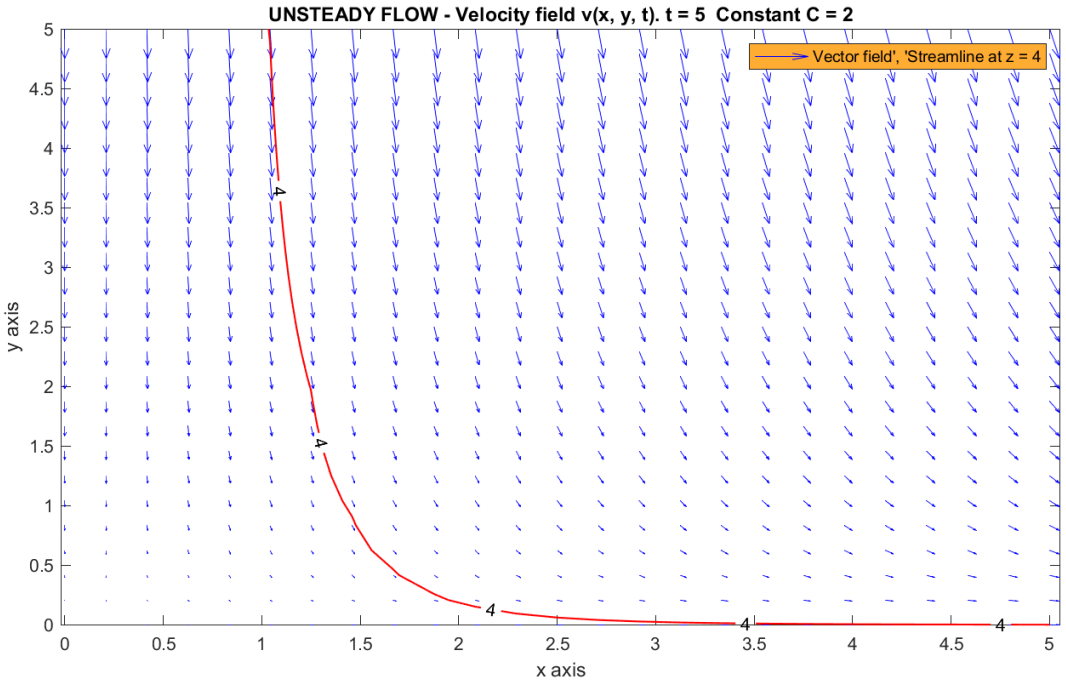
To represent the fluid pattern, it takes to give form to the general expression of function $z = f(x,y,t)$:

$$z = f(x,y,t) = y * x^t - C = 0$$

To plot the function, $z = f(x,y,t)$ must be represented on a plane parallel to x-y plane. So:

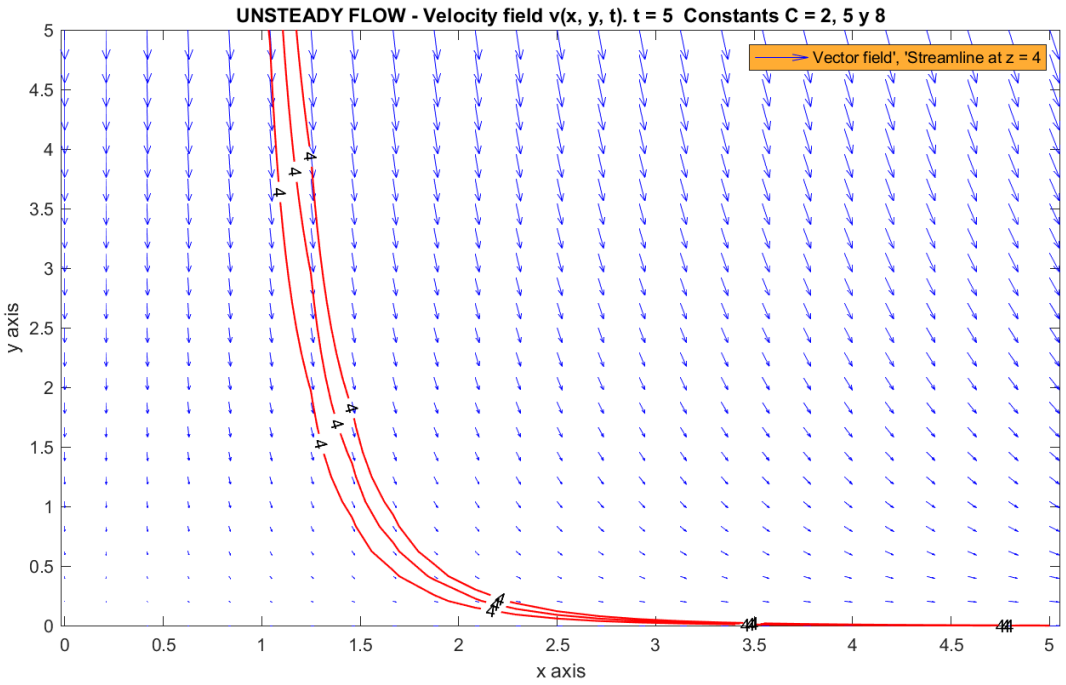
$$z = f(x,y,t) = y * x^t - C = level,$$

Represent fluid in a 2-D plane. For a constant C = 2. ***(Check video generated) :***




```
DONE!
```

Represent fluid in a 2-D plane. For constants C = 2, 5 and 8. ***(Check video generated):***

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DONE!
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