Flipping Physics Lecture Notes:
Ideal Fluid Flow
http://www.flippingphysics.com/ideal-fluid-flow.html

Up to this point we have only considered stationary fluids. Today, the fluids are going to start moving! Now, just like when we first learn about projectile motion we do not include air resistance, when we first learn about fluid flow, we begin with ideal fluid flow.

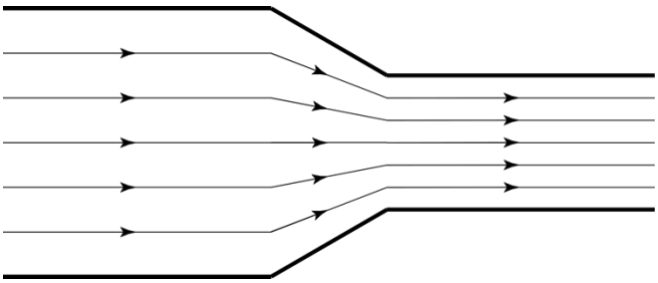
The four conditions for ideal fluid flow:

1) The fluid is nonviscous.
2) The fluid is incompressible.
3) The flow is steady.
4) The flow is irrotational.

An ideal fluid is nonviscous: Viscosity is the measure of a fluid's resistance to flow or a measure of the internal friction in a fluid. The viscosity of water is very low, the viscosity of maple syrup is higher than the viscosity of water, and the viscosity of ketchup is higher than maple syrup. The viscosity of a fluid causes the kinetic energy of the fluid to be converted to internal energy. When we say an ideal fluid is nonviscous, we mean it has zero internal friction and none of its kinetic energy is being converted to internal energy.

An ideal fluid is incompressible. That means the density of an ideal fluid remains constant. Liquids usually tend to be rather incompressible, however, gasses really are quite compressible.

Ideal flow is steady, or what is called laminar flow. Flow that is non-steady is called turbulent flow. Turbulent flow is irregular and inconsistent. Typically, slower speeds are necessary for laminar flow and larger speeds cause turbulent flow. In laminar flow all the particles of the fluid have the same velocity as they pass a given point. Typically, fluid flow is shown using streamlines, where the velocity of a particle at each point in the path is tangent to the streamline. In laminar flow, the streamlines will not change over time. The closer the streamlines are to one another, the faster the flow of the fluid.



Ideal flow is irrotational. That means the fluid does not have net angular velocity. If you were to place a small paddle wheel in the fluid, the paddle wheel would not rotate about its center of mass.