Lecture 19: Vector Fields

1 Definition of Vector Fields

A vector field can be described with such a formula:

$$\vec{F} = M\hat{\mathbf{i}} + N\hat{\mathbf{j}}$$

where M and N are functions of coordinates.
In a vector field, at each point (x, y) there is a corresponding vector. In other words, vectors in a vector field are a function of the position.
Real world examples of a vector field:

- Velocity field in fluid $\vec{v}$.
- Force field $\vec{F}$.

2 Plot of Vector Fields

Plot of a vector field enables us to understand the vector field in a concrete way and probably provides some important insights.

Example 1. *Plot the vector field* $\vec{F} = 2\hat{\boldsymbol{\imath}} + \hat{\boldsymbol{\jmath}}$.

Example 2. *Plot the vector field* $\vec{F} = x\hat{\boldsymbol{\imath}}$.