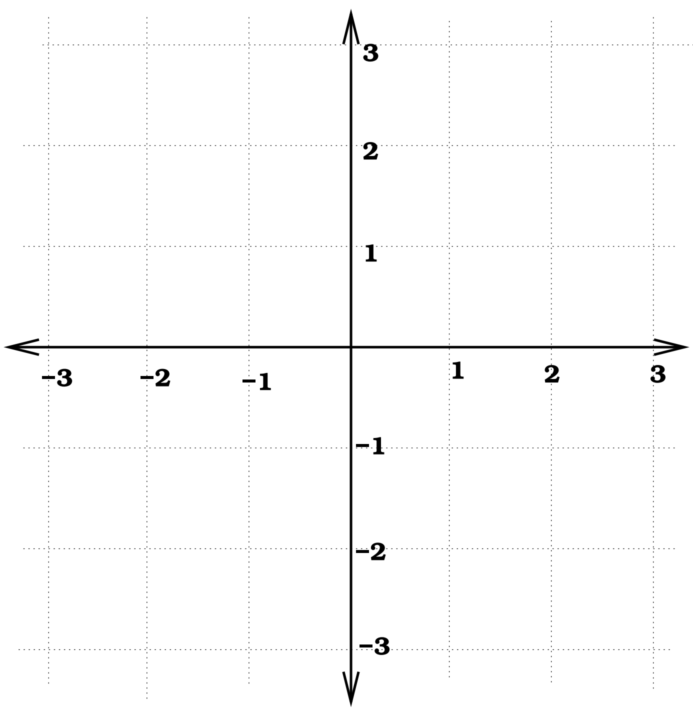
Section 16.1: Vector Fields

Definition: Let D be a set of points in either $\Re^2$ or $\Re^3$. A **vector field** is a function **F** that assigns to each point in D to a vector.

in $\Re^2$: $\mathbf{F}(x,y) = \langle P_1(x,y), P_2(x,y)\rangle$ in $\Re^3$: $\mathbf{F}(x,y,z) = \langle P_1(x,y,z), P_2(x,y,z), P_3(x,y,z)\rangle$

Example: Sketch the vector field $\mathbf{F}(x,y) = \langle 1, 2x\rangle$



Definition: If f is a scalar function then the gradient of f, $\nabla f = \langle f_x, f_y\rangle$, is called a **gradient vector field**.

A vector field F is called a **conservative vector field** if it is the gradient of some scalar function f, i.e. $\mathbf{F}(x,y) = \nabla f(x,y)$. The function f is called a **potential function** for **F**.

Example: Find the gradient vector field for $f(x,y,z) = x\ln(y-z)$.