Vector Fields
Scalar and Vector Fields

Question

Describe the streamlines of the following velocity field.

$$\underline{v}(x, y, z) = \frac{x\underline{i} + y\underline{j}}{(1 + z^2)(x^2 + y^2)}$$

Answer

The streamlines satisfy $dz = 0$ and $\frac{dx}{x} = \frac{dy}{y}$. Thus $z = C - 1$ and $y = C_2 x$.
The streamlines are horizontal half-lines emanating from the z-axis.