Vector Fields

Scalar and Vector Fields

Question

Describe the streamlines of the following velocity field.

$\underline{v}(x, y, z) = e^{xyz}(x\underline{i} + y^2\underline{j} + z\underline{k})$

Answer

The field lines satisfy $\frac{dx}{x} = \frac{dy}{y^2} = \frac{dz}{z}$.

So they are given by $z = C_1 x$, $\ln|x| = \ln|C_2| - (1/y)$ (or, equivalently, $x = C_2 e^{-1/y}$.)