Vector Fields
Scalar and Vector Fields

Question

Describe the streamlines of the following velocity field.

$\underline{v}(x, y, z) = xz\underline{i} + yz\underline{j} + x\underline{k}$

Answer

The field lines satisfy $\frac{dx}{xz} = \frac{dy}{y^2} = \frac{dz}{x}$, or equivalently, $\frac{dx}{x} = \frac{dy}{y}$ and $dx = zdz$.
Thus the field lines have equations $y = C_1 x$, $2x = z^2 + C_2$ and are therefore parabolas.