

Problems: Vector Fields

1. Sketch the following vector fields. Pay attention to their names because we will be encountering these fields frequently.

(a) Force, constant gravitational field $\mathbf{F}(x, y) = -g\mathbf{j}$.

(b) Velocity $\mathbf{V}(x, y) = \frac{x}{x^2 + y^2}\mathbf{i} + \frac{y}{x^2 + y^2}\mathbf{j} = \langle x, y \rangle / r^2$. (This is a shrinking radial field –like water pouring from a source at $(0,0)$.)

(c) Unit tangential field $\mathbf{F} = \langle -y, x \rangle / r$.

(d) Gradient $\mathbf{F} = \nabla f$, where $f(x, y) = \frac{xy}{3}$ and $\nabla f = \langle \frac{y}{3}, \frac{x}{3} \rangle$.

2. Compute the gradient field of $f(x, y) = xy^2$.

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