

PHYS 333 — Problem Set #1

Reading: Griffiths — Advertisement (pp. *xiv–xviii*), Chapter 1.1–1.4

Reading Response (due before 9:00 a.m. on Friday morning): After looking over the assigned reading send me an email indicating if any of the material was not covered in a previous class. Also let me know there are any sections that merit special review, even if it was covered in a previous class.

Problems due Friday August 29:

1. Using arrows of appropriate relative magnitude and direction, sketch a representative set of vectors for each of the following vector fields:

(a) $\mathbf{g}(\mathbf{r}) = \frac{1}{\sqrt{2}} (\hat{\mathbf{x}} + \hat{\mathbf{y}})$

(b) $\mathbf{h}(\mathbf{r}) = (-y \hat{\mathbf{x}} + x \hat{\mathbf{y}}) / (x^2 + y^2)$ (exclude the origin)

(c) $\mathbf{i}(\mathbf{r}) = 2 \hat{\mathbf{r}} - \hat{\boldsymbol{\theta}}$ (exclude the origin)

2. Write an expression in **Cartesian** coordinates describing a vector field in two dimensions that points in the positive radial direction and whose magnitude is 1. (Exclude the origin.)
3. Write an expression in **polar** coordinates describing a vector field in two dimensions which points in the positive radial direction and whose magnitude is 1. (Exclude the origin.)
4. Write an expression in **Cartesian** coordinates describing a vector field in two dimensions whose direction is everywhere tangent to a circle centered on the origin and whose magnitude at any point is equal to the distance of the point from the origin.
5. Write an expression in **polar** coordinates describing a vector field in two dimensions whose direction is everywhere tangent to a circle centered on the origin and whose magnitude at any point is equal to the distance of the point from the origin.
6. Write an expression in **Cartesian** coordinates describing a uniform vector field of magnitude 2 which points in a direction 30° above the direction of the positive x axis.

7. Griffiths 1.2
8. Griffiths 1.3
9. Griffiths 1.7 (Use Cartesian coordinates.)