Reading assignment: Griffiths pages 1-24, and the 5 page “Advertisement” just before Chapter 1.

Problem 1  Compute the dot product and the cross product of the vectors:

\[ \vec{A} = -\hat{x} - 2\hat{y} + 3\hat{z} \]
\[ \vec{B} = 3\hat{x} - 2\hat{y} + \hat{z} \]

What is the angle between the vectors \( \vec{A} \) and \( \vec{B} \)?

Problem 2  Find the gradients of the functions:

(a) \( f(x, y, z) = \frac{xy}{z} \)
(b) \( f(x, y, z) = \frac{1}{\sqrt{x^2 + y^2 + z^2}} \)
(c) \( f(x, y, z) = e^{ax} \cos(bz) \)

Problem 3  Find the divergence and the curl of the vector function:

\[ \vec{B}(x, y, z) = (x^2 + yz)\hat{x} + (y^2 + xz)\hat{y} \]

Problem 4  Prove by explicit calculation that the curl of the gradient of every scalar function \( f(x, y, z) \) is always zero.

Problem 5  Find the Laplacian of each of the functions in Problem 2.