Reading

Textbook: *Elements of Electromagnetics*, 7th Ed.
Matthew N. O. Sadiku
Oxford University Press

Assignment: Read Chapters 1-3, 9 and 10.

Lectures: Topics 1-3
From *Electromagnetic Field Theory*
https://empossible.net/academics/emp3302/

Vector Calculus

Problem #1 – Gradient

Calculate the gradient of $f(x) = 2\sin x - x^2yz + xe^y$ at the point $(2,3,5)$.

Problem #2 – Divergence

Calculate the divergence of $\vec{u}(x) = x^2\hat{a}_x + e^{xy}\hat{a}_y + xyz\hat{a}_z$ at the point $(-1,1,2)$.

Problem #3 – Curl

Calculate the curl of $\vec{h}(x) = x^2y^2\hat{a}_x + 2xyz\hat{a}_y + z^2\hat{a}_z$ at the point $(1,-2,1)$.

Wave Equation

Problem #4 – Solving the Wave Equation

Find the general solution to the following differential equation and boundary conditions.

$$\frac{d^2f}{dz^2} - \gamma^2 f = 0$$

$$f(0) = 1 \qquad \frac{df(0)}{dz} = 0$$

Problem #5 – Maxwell's Equations

Given the following expression for the electric field $\vec{E}$ component of a wave in vacuum, derive the expression for the magnetic field intensity $\vec{H}$ using Maxwell's equations and the constitutive relations.

$$\vec{E}(t,z) = A\cos\left[\omega\left(t - z/c_0\right)\right]\hat{a}_y$$