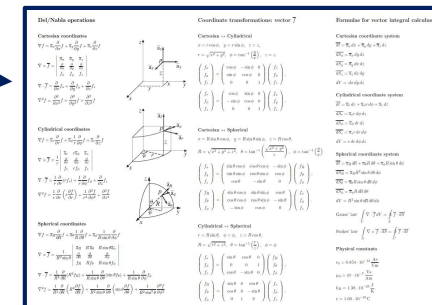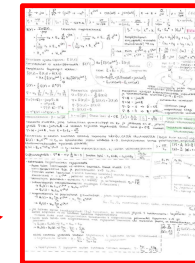# ELEC-C9430   Electromagnetism   Spring 2022

- Exam on **13 April at 13–16** in Hall TU1
  - pocket calculator allowed in the exam
  - one A4 sheet of notes can be taken to the exam
  - no other material
  - formula sheet will be provided

- Weight of homework grade and exam: 50/50

- Retake exam on 16 May

$$\sin(\omega t) \Big|_s \quad \Big| \epsilon \rightarrow \epsilon + \frac{\sigma}{j\omega} \Big|_s \quad \Big| v = \frac{1}{\sqrt{\mu\epsilon}} \Big| \quad j \cdot (-j) = 1$$

$$\frac{\pi}{\mu_o\epsilon_o} = \frac{2\pi c}{\omega} = \frac{c}{f} \quad \Big\| \frac{k}{\omega\mu_o} = \frac{1}{\eta_o} \quad k = \omega\sqrt{\mu_o\epsilon_o} \quad \frac{j}{j} = 1$$

$$\Big| \eta_o^* = \eta_o \Big| k^* = k \Big| E_o \cdot E_o^* = |E_o|^2 \Big| \quad \boxed{j \cdot j = -1}$$

kompleksiluvun
konjugaatti $\Rightarrow$ muuta
etumerkkia! $^{kuv.osa}$

$$(u_x + u_y)(u_y + u_z)$$
$$= (u_x \cdot u_y + u_y \cdot u_x)$$

esim $e^{-jk_ox} \Rightarrow e^{+jk_ox}$ $\Big| f = \frac{\omega}{2\pi}$ (Hz) $\Big| [\omega] = \frac{1}{s}$

$e^{-jkz} \cdot e^{+jkz} = \frac{e^{jkz}}{e^{jkz}} = 1 \Big| \frac{\partial}{\partial t} = j\omega \Big| (ab)^* = a^*b^*$

(z') $\qquad -\sin(0) = 0$

The central concepts of the course

- Mathematical tools:
  - Coordinate systems
  - Grad, Div, Curl
  - Divergence and Stokes theorems

- Electrostatics:
  - Scalar potential, Poisson and Laplace equations, field solution for charge distributions, electric dipole, image principle

- Magnetostatics:
  - Field due to long straight wire, magnetic dipole, vector potential

- Electrodynamics:
  - The four Maxwell equations
  - Concept of time-harmonic fields and complex vectors, Poynting vector
  - Plane waves in free space, and in lossless and lossy medium, polarization types, decibels
  - Reflection from a planar interface, perpendicular and parallel polarizations
  - Properties of the Hertzian dipole, radiation, directivity and gain of antennas, Friis formula