Reading assignment
Ulaby, 3-5
Connor and Salon, II-26 → II-34

Software
div_curl_example.m
Maple (check your solutions)

Problem 1 - Surface integrals
Calculate \( \int A \cdot ds \) for each of the following cases.

a. \( A = 3 \mathbf{a}_r \), surface is \( r = 3, 0 \leq \varphi \leq \pi/3, -2 \leq z \leq 2 \).

b. \( A = 2r \mathbf{a}_r + 6r \mathbf{a}_\varphi \), surface is \( 0 \leq r \leq 5, \theta = \pi/3, 0 \leq \varphi \leq 2\pi \).

Problem 2 - Divergence
Calculate \( \nabla \cdot A \) for each of the vectors below.

a. \( A = x^2y \mathbf{a}_x + c^2x \mathbf{a}_z \)

b. \( A = c/r^2 \mathbf{a}_r + e^{j\beta} \sin \theta/r \mathbf{a}_\varphi \)

\( c \) and \( \beta \) are constants. Use the worksheet associated with Problem 2.10.4 in "Visual Electromagnetics for Mathcad" to check your answer. (You may have to use specific numbers instead of the variables \( c \) and \( \beta \).)

Problem 3 - Divergence theorem
Show that the divergence theorem is valid by calculating \( \int (\nabla \cdot A) \, dv \) and

\[ \oint A \cdot ds \]

for the vector \( A \) of Problem 2a. The volume integral should be for a cube with sides of length \( l \) as shown below. One of the corners is located on the origin.