Quiz 1, ECED 3300

Instructor: Sergey A. Ponomarenko.
Place, Date and Time: B308; Tuesday, October 1 2019, 11:35 am to 12:25 pm.
Closed Books: Formula sheets are provided; no calculators are allowed.
Hint: *Make sure to justify all your answers to get full credit.*

Problem 1 (8 pts)

Consider the vector field,

$$\mathbf{A} = \mathbf{a}_x(x + c_1 z) + \mathbf{a}_y(z + c_2 y) + \mathbf{a}_z(y + c_3 x).$$

Under what conditions on the parameters c_1, c_2 and c_3 does $\mathbf{A}$ have a zero curl at every point in space?

Problem 2 (10 pts)

Verify Gauss's theorem for the vector field $\mathbf{F} = \mathbf{a}_r$ and a sphere of unit radius, centered at the origin.

Problem 3 (12 pts)

Given the field $f = (\mathbf{a}_z \times \mathbf{r}) \cdot (\mathbf{a}_z \times \mathbf{r})$, where $\mathbf{r}$ is a position vector,

a) determine the gradient of f; (10 pts)

b) express your answer to part (a) in the cylindrical coordinates. (2pts)