

## Homework 8 × (20 points each)

1. Calculate

$$\vec{\nabla} \phi$$

$$\vec{\nabla} \cdot \vec{V}$$

$$\nabla^2 \phi$$

$$\vec{\nabla} \times \vec{V}$$

for general case of coordinate representation in 3 space.

2. Calculate above expressions for Cylindrical reference frame

3. Calculate above expressions for Spherical reference frame

4. Calculate operators of problem 1,  
for the case of  $\phi(r)$ ,  $\vec{V} = \vec{r} B(r)$

At the end consider the special cases of  $\phi(r) = r^n$  and  $B(r) = r^n$ .