

Homework 5 (20 points each)

1. Obtain matrix of rotation in 2 D space for rotation by angle ϕ

2. Generalize the matrix of rotation in 3 D space expressed through unit vectors.

3. Show that matrix of rotation in 3 D space in the form of unit vectors is a orthogonal matrix i.e. $S^T = S^{-1}$

4. Obtain 3 D rotational matrix through the partial derivatives like Eq. (3.33)
prove also the relation (3.34)

5. Calculate the gradient of $f(r) r^n$ and consider cases of $f = 1$,
 $n = 1$,
and $f = 1$ and $n = -1$.

6. Calculate divergence of $f(r) r^n \hat{r}$ cases of $f = 1$, $n = 1$,
and $f = 1$ and $n = -2$.