

Homework Assignment #19

(due Oct. 2, 2020, 11pm, via gradescope)

1. Griffiths 3.28

Hints:

$$\mathbf{r} = r \sin \theta \cos \phi \hat{\mathbf{x}} + r \sin \theta \sin \phi \hat{\mathbf{y}} + r \cos \theta \hat{\mathbf{z}}$$

$$\mathbf{r}' = R \cos \phi' \hat{\mathbf{x}} + R \sin \phi' \hat{\mathbf{y}}$$

$$\mathbf{r} \cdot \mathbf{r}' = rR \cos \alpha'$$

$$\int_0^{2\pi} \cos^2 \phi' d\phi' \int_0^{2\pi} \sin^2 \phi' d\phi' = \pi$$

$$\sin \phi' \cos \phi' = \frac{1}{2} \sin(2\phi')$$

2. Griffiths 3.29

3. Griffiths 3.30

4. Griffiths 3.33

Hint for 3.33c: $W_{\text{done by system}} = -q \int_{\mathbf{r}_1}^{\mathbf{r}_2} \mathbf{E} \cdot d\mathbf{l} = q \int_{\mathbf{r}_1}^{\mathbf{r}_2} \vec{\nabla} V \cdot d\mathbf{l} = qV(\mathbf{r}_2) - V(\mathbf{r}_1)$