PHYS 301
HOMEWORK #2

Due : 30 Jan. 2017

1. Find the scale factors for the spherical polar coordinate system (r, θ, ϕ). We will use the convention that θ is the polar angle (measured down from the north pole) and ϕ is the azimuthal angle (measured counterclockwise up from the positive x axis).   (10)

2. Find expressions for unit vectors $\hat{r}$, $\hat{\theta}$, and $\hat{\phi}$ in terms of the Cartesian unit vectors. (10)

3. a) Use algebraic techniques to express Cartesian unit vectors in terms of $\hat{r}$, $\hat{\theta}$, and $\hat{\phi}$. (10)

b) Extra Credit : Verify these results using matrix algebra methods. (5)

4. Use these results to write the position vector completely in spherical polar coordinates.