

## PROBLEM 1

Calculate the flux of the vector field:

$$\text{grad} \left( \frac{1}{\sqrt{(x-3)^2 + (y+1)^2 + z^2}} + xy^3 \right)$$

On a sphere with radius 3 and centre in the point (2,1,1)

## PROBLEM 2

A quadrupole in the origin produce the vector field:

$$\frac{3 \cos^2 \theta - 1}{r^4} \hat{e}_r + \frac{\sin 2\theta}{r^4} \hat{e}_\theta$$

Use the Gauss' theorem to calculate the flux on the cylinder:

$$\begin{cases} x^2 + y^2 \leq 9 \\ -1 \leq z \leq 2 \end{cases}$$

### PROBLEM 3

Calculate the following line integral:

$$\oint_L \frac{2}{\rho} \hat{e}_\phi \cdot d\vec{r}$$

where the path L is  
the one shown in the figure.

