1. (3 points) Compute $\vec{\nabla} \times \vec{F}$, where $\vec{F}(\vec{r}) = \frac{\hat{r}}{r^2}$.

2. (a) (1 point) Express $\vec{\nabla} f$ in spherical coordinates:

(b) (1 point) Express $\vec{\nabla} \cdot \vec{F}$ in cartesian coordinates:
3. (5 points)

(a) Write \( \hat{\rho} \) and \( \hat{\phi} \) in hybrid representation.

(Hint: Make a 2D sketch showing the relationship between \( \hat{\rho}, \hat{\phi} \) and \( \hat{x}, \hat{y} \).)

(b) Compute \( \frac{\partial \hat{\rho}}{\partial \phi} \) and \( \frac{\partial \hat{\phi}}{\partial \phi} \) and then express those quantities in cylindrical coordinates.