Math 2415

Paper Homework #13

1. **16.5, Curl and Divergence:** Compute the divergence and curl of the vector field

$$\mathbf{F} = \frac{x\mathbf{i} + y\mathbf{j} + z\mathbf{k}}{(x^2 + y^2 + z^2)^{3/2}}.$$

2. **16.6, Parametrized Surfaces:** Let S be the surface with parametrization

$$(x, y, z) = \mathbf{r}(u, v) = u\cos v\,\mathbf{i} + u\sin v\,\mathbf{j} + u\,\mathbf{k} \qquad u \geq 0, \quad 0 \leq v \leq 2\pi.$$

   (a) Show that S is a cone. **Hint:** Find an equation of the form $F(x, y, z) = 0$ for this surface by eliminating u and v from the equations for x, y, and z above.

   (b) Sketch the cone, together with the "grid" curves on the cone where (a) $u = 2$ and (b) $v = \pi/4$.

   (c) Find a parametrization of the tangent plane to the cone at the point where $(u, v) = (2, \pi/4)$. Add this tangent plane to your sketch.