Stokes' and Divergence Theorems

1. If S is the sphere $x^2 + y^2 + z^2 = 1$, oriented inwards, and

$$\mathbf{F} = xz\mathbf{i} + \tan z\mathbf{j} + e^{xy}\mathbf{k}$$

   (a) Calculate div($\mathbf{F}$).

   (b) Use the divergence theorem to setup a triple integral to evaluate $\int_S \mathbf{F} \cdot d\mathbf{S}$.

2. If C is the intersection of $z = \sqrt{x^2 + y^2}$ and $z = 2$, and

$$\mathbf{F} = \cos(x^2)\mathbf{i} + z^2\mathbf{j} + z\mathbf{k}$$

   (a) Calculate curl($\mathbf{F}$).

   (b) Use Stokes' theorem to setup an integral to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$.