

Name _____ Date _____

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. (10 points each) Set up the triple integral (do not evaluate!!!) to find the volume of the solid inside the sphere $x^2 + y^2 + z^2 = 16$, outside the cone $z = \sqrt{x^2 + y^2}$, and above the xy -plane. (Use **spherical coordinates**)

Answer : _____

2. (10 points) Find $\nabla \cdot \mathbf{F}$ (div \mathbf{F}) and $\nabla \times \mathbf{F}$ (curl \mathbf{F}) given $\mathbf{F} = 3xy\mathbf{i} - 2x^2\mathbf{j} + yz^3\mathbf{k}$.

$$\nabla \cdot \mathbf{F} = \underline{\hspace{10cm}}$$

$$\nabla \times \mathbf{F} = \underline{\hspace{10cm}}$$

3. (10 points) Evaluate $\int_1^2 \int_1^z \int_0^{\sqrt{x}} 12xyz \, dy \, dx \, dz$.

Answer: _____

4. (10 points) Set up the triple integral (**do not evaluate!!!**) to find the volume of the solid in the first octant bounded by $y = 4x^2$ and $3y + 4z = 12$.

Answer: _____