

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. (18 points) Calculate the volume of the solid bounded by the paraboloid $z = x^2 + y^2$ and the plane $z = 4$.

Answer : _____

2. (14 points) Calculate $\text{div } \mathbf{F}$ and $\text{curl } \mathbf{F}$ for the vector field

$$\mathbf{F}(x, y, z) = e^x \cos(y) \mathbf{i} + e^x \sin(y) \mathbf{j} + z \mathbf{k}$$

$\text{div } \mathbf{F} :$ _____

$\text{curl } \mathbf{F} :$ _____

3. (2 points each) If $f(x,y,z)$ is a scalar function and $\mathbf{F}(x,y,z)$ is a vector field, which of the following make sense (circle one):

a) $\nabla \cdot \nabla(f)$ Makes sense. Does not make sense.

b) $\text{div}(\text{grad}(f))$ Makes sense. Does not make sense.

c) $\text{grad}(\text{div}(\mathbf{F}))$ Makes sense. Does not make sense.

d) $\nabla \times \nabla(f)$ Makes sense. Does not make sense.