Problem Set for Week 11

The work handed in should be entirely your own. You can consult Stewart and/or the class notes but nothing else. To receive full credit, justify your answer in a clear and logical way. Due Apr. 15.

Reading. This is the most important part of the homework: Read Sections 16.8, 15.7–15.8 of the textbook carefully.

1. Section 16.8 Exercises 10, 14,

2. Section 15.7 Exercises 4, 10, 12, 22, 28.

3. Evaluate the integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$ Here $\mathbf{F}$ is the field

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

   The surface S is the top half of an ellipsoid, oriented upward, given by the equations

$$x^2 + y^2 + 4z^2 = 1, \quad z \geq 0.$$

4. Find a field $\mathbf{F}$ so that

$$\operatorname{curl} \mathbf{F} = z\mathbf{i} + xy\mathbf{j} + (y - xz)\mathbf{k}.$$