

Math 215
Homework Set 9: §§17.4 – 17.6
Winter 2008

Most of the following problems are modified versions of the recommended homework problems from your text book *Multivariable Calculus* by James Stewart.

17.4d. Please do Problem 22 of §17.4 in Stewart's *Multivariable Calculus*.

17.4e. Verify Green's Theorem for the line integral

$$\int_C x^3 y \, dx - x^2 y^2 \, dy$$

where C consists of the parabola $y = x^2 - 4$ from $(1, -3)$ to $(-1, -3)$ and the line segment from $(-1, -3)$ to $(1, -3)$.

17.5a. The role of curl and divergence in multivariable Calculus is similar to the role of words in a composition; in order for the final product to make sense, you need to know in which order things may be placed. To this end, please do Problems 12, 19, 20, 23–29 of §17.5 in Stewart's *Multivariable Calculus*.

17.6a. Find the area of the finite part of the paraboloid of revolution $z = 3x^2 + 3y^2$ cut off by the plane $z = 75$.

17.6b. Find the area of the surface that lies on the sphere $x^2 + y^2 + z^2 = 4x$ and inside the paraboloid of revolution $x = y^2 + z^2$. Hint: Sketch the surface.

17.6c. Find an equation for the tangent plane to the surface parameterized by

$$\mathbf{r}(u, v) = \langle u^2, v^2, uv \rangle$$

at the point $(4, 4, -4)$. Sketch a graph of the surface and the tangent plane. Use MAPLE if you wish.

17.6d. Please do Problems 13-18 of §17.6 in Stewart's *Multivariable Calculus*.

17.6e. Sketch the surface described by the parameterization

$$\mathbf{r}(u, v) = \langle 2u \cos(v), 2u \sin(v), v \rangle$$

for $1 \leq u \leq 4$ and $v \in [\pi, 2\pi]$. Find the area of this surface.

17.6f. Find a parametric representation for the upper half of the ellipsoid $4x^2 + 2y^2 + z^2 = 1$.

17.6g. Find a parametric representation for that part of the sphere of radius 12 centered at the origin that lies above the cone $z = \sqrt{x^2 + y^2}$.